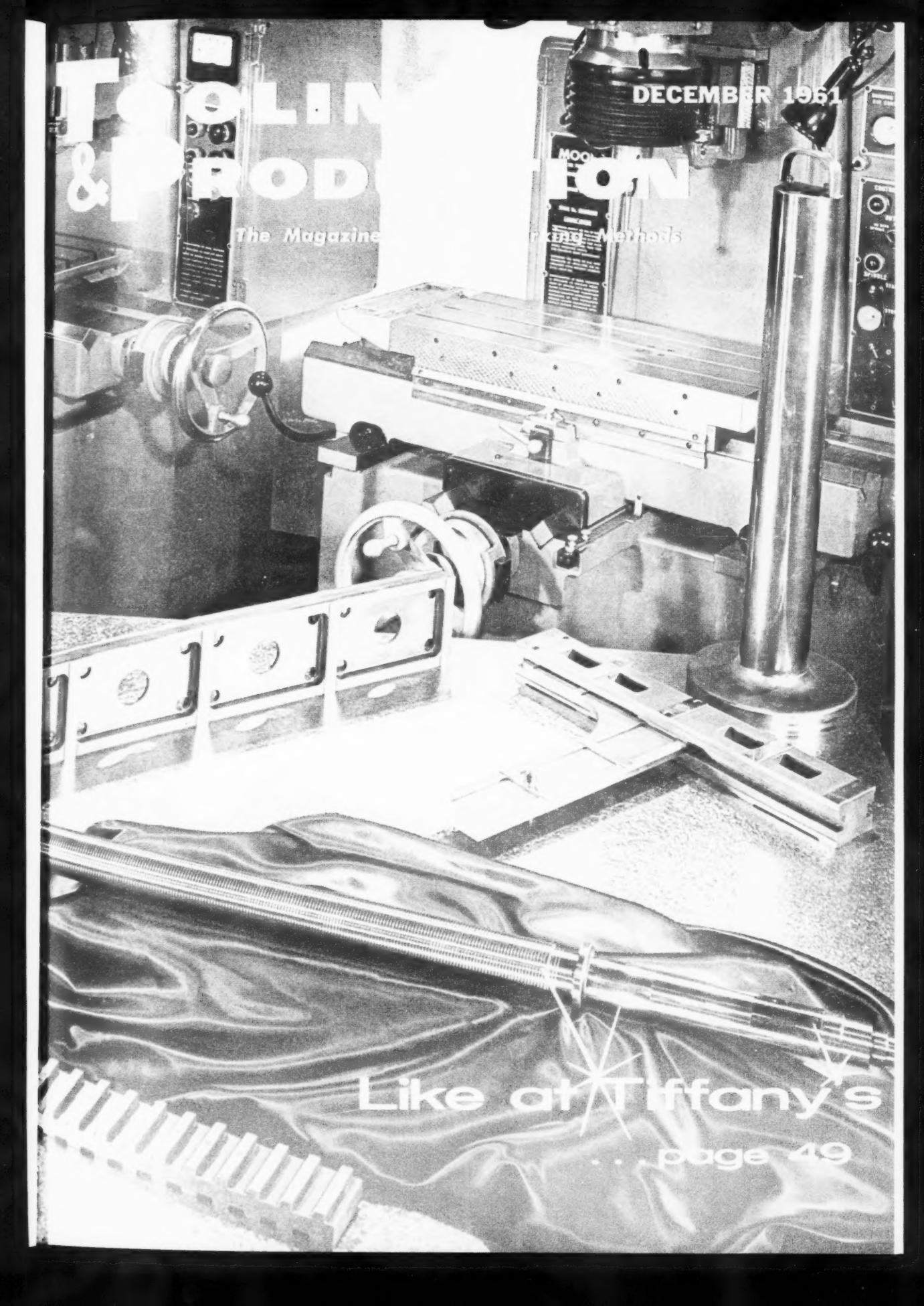
DECEMBER 1961
The Magazine
Like at Tiffany's
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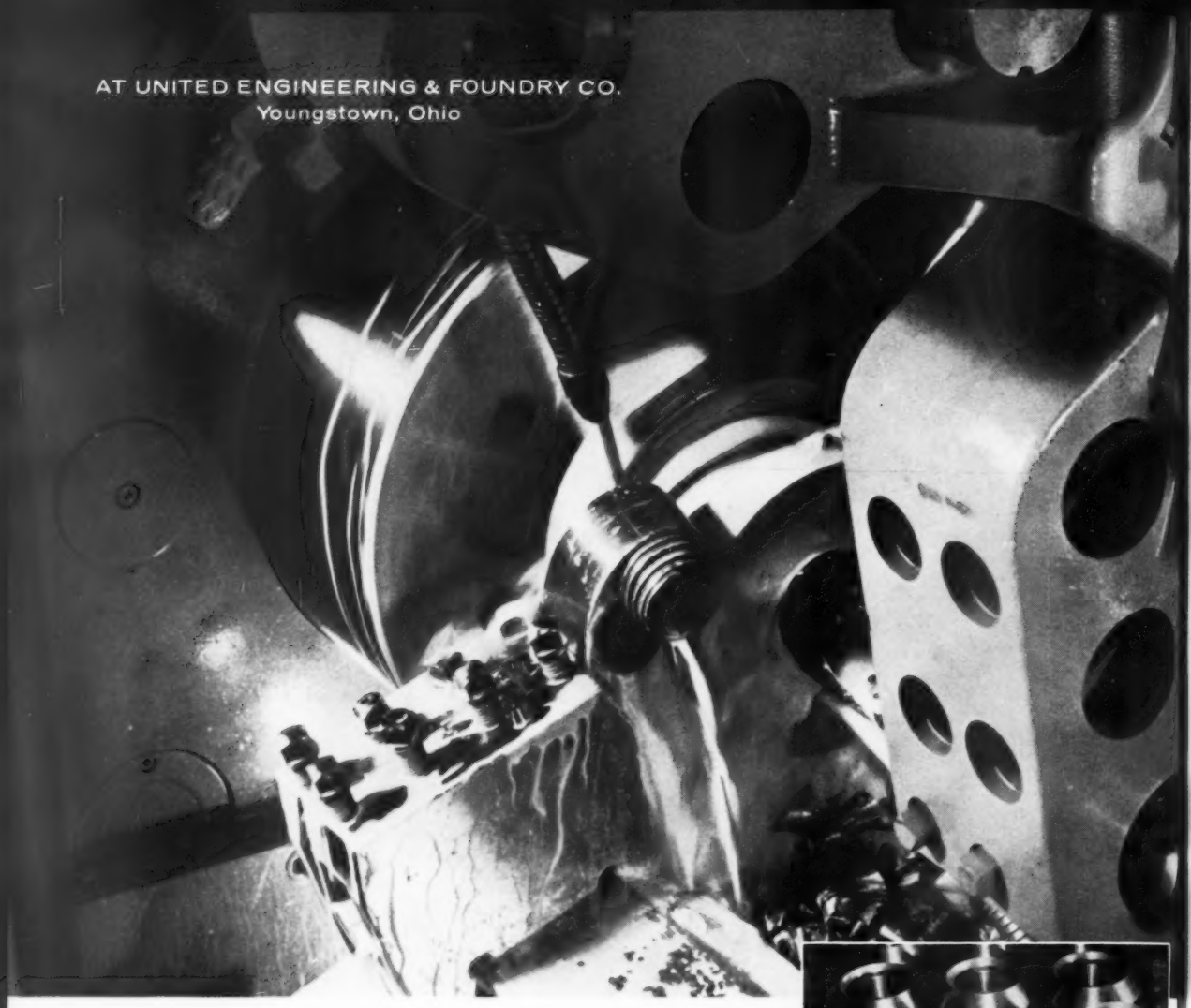

1″ deep cuts and .001″ tolerances no problem on rugged 3AC Automatic

A Warner & Swasey heavy duty Chucking Automatic outproduces large turret lathe 4 to 1 on 15″ diameter bevel gears

Heavy machine usage is not at all unusual at the Youngstown plant of United Engineering & Foundry Company, a leading producer of mammoth special purpose machinery for the steel and nonferrous metals industries. To cut their costs on work involving heavy stock allowances, close tolerances and small lots, United installed a Warner & Swasey 3AC Chucking Automatic. This machine's proven accuracy, metal removal capacity, fast setup and tooling flexibility ideally met their needs.

The 3AC, now working two and three shifts on 20 to 100-piece lots, involving 1″ deep cuts in bores, ½″ wide facing cuts, and 1½″ wide form cuts has increased production on 15″ diameter bevel gears from 3 to 4 pieces a day to 14 to 16 a day.

Perhaps similar benefits await you. Why not go over your tough metal turning problems with a Warner & Swasey Field Engineer? Warner & Swasey Company, Cleveland 3, Ohio.

Mitre gears are typical of the heavy metal removal problems at United Engineering. Large stock allowances and tolerances of .001″—often on the same part—place special value on the 3AC's ability to rough and finish in one operation.

WARNER & SWASEY

YOU CAN TURN IT BETTER, FASTER, FOR LESS...WITH A WARNER & SWASEY

CIRCLE INFORM-A-GRAM KEY NO. 2

TOOLING & PRODUCTION
The Magazine of Metal Working Methods

VOL. 27, No. 9
DECEMBER 1961

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Vol. 27, No. 9 George J. Huebner, Founder 1885-1956

TOOLING & PRODUCTION MAGAZINE

R. L. Huebner
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The Horn of Plenty

The wheat is gathered, the harvest is in and the yield is bountiful. Traditionally at this time, Americans pause in gratitude to reflect upon the richness this land of ours has bestowed—in both material wealth and wealth of opportunity.

We at American are truly thankful for what we have attained—in 20 short years, from a small and little known company to the enviable position of the world's largest manufacturer of drill jig bushings, with 36,000 standard sizes in stock.

Only in America—the Land of Plenty—could this American success story happen—and only with the support of American business.

American gives thanks—humbly and sincerely—to the 200,000 loyal customers whose consistent purchases of our products have made the American dream come true. May we continue to serve you long and well.

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CIRCLE INFORM-A-GRAM KEY NO. 4

Personally Speaking...

Dear T & P Reader:

Well, it is the same now as it is every year at this time. We are at the end of one year and close to the beginning of another, and, if you are anything like I am, it is hard to realize that 1961 is practically history.

We are starting off the new year with a feature article in the January issue that we think may contribute some very valuable ideas and information for the good of yourself and your company. This article will deal with the subject of futurization. As far as we know, futurization is not a common word, but to us it has a very positive meaning. To us it simply means modernizing before you absolutely have to. There is economy in this and we are going to try to prove it in this feature article on futurization that will appear in January. I hope you will read it and will find it of great interest and value. It will include a lot of case histories with some good solid facts.

Last month I mentioned that one of the members of my family this year is an American Field Service foreign student from the Republic of Colombia in South America. Until her presence in the house for the last couple of months, I never realized the significance of something that we all grow up with in the United States. I am referring to our educational system. We all seem to take for granted our free schools and we accept without appreciation the fact that residents of our country are legally required to attend school until they attain a certain age, usually 16. To many other places in the world education of any kind is a privilege only for those who can pay for it. This is what is wrong with much of the world today.

Have you by any chance read about the new tape controlled drilling machine recently announced by one of our leading machine tool manufacturers? You will find it described elsewhere in this issue of Tooling & Production. Be sure to investigate it if you need to automate drilling operations on single pieces or short runs. It looks to us as though anyone who could beneficially use this machine and its modestly-priced controls can afford it because the combination is offered at an unprecedented low price.

Seasons greetings and best wishes for the best year ever in 1962.

Cordially yours,

Ray Hackner

Publisher

NEW

V-R Boring Bars are micro-adjustable for controlled diameter adjustment

Here's a unique concept in boring bar design that combines a micro-adjustable feature with the economies of throw-away inserts. Fast, simple and positive diameter adjustment in increments of 0.001" save your set-up and production time — bring you greater boring accuracy. V-R carbide "throw-aways" slash tool costs — eliminate grinding, reduce tool inventory and make tool changes easy and fast. A built-in, adjustable chip breaker adapts tools to light, medium or heavy cuts.

V-R Boring Bars replace conventional boring tools, reamers, single-point tools and multiple-point boring heads on hundreds of applications. They are used on automatic or hand screw machines, boring mills, turret lathes and multiple-spindle bar machines. Micro-adjustable styles are available for small hole finishing, shallow boring and deep hole boring. Non-adjustable styles with throw-away inserts are also available.

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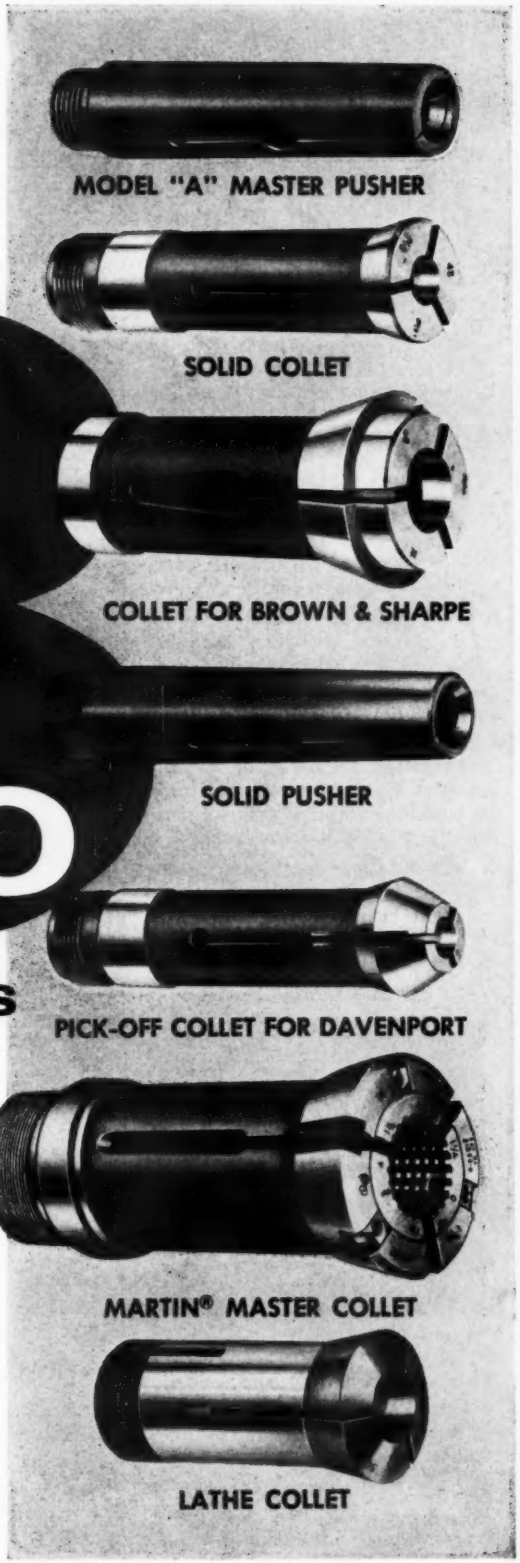

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possibilities unlimited

for lowest cost per drilled hole!

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. . . equip it with slip spindles, and a jig-bored slip spindle plate for every production hole-pattern job you have (or want) within the capacity of the head;

. . . for each long-run, complicated or multi-piece setup, use a plain or indexing holding fixture and guide bushing plate;

. . . for short runs, merely locate the standard adjustable arm brackets quickly and accurately with a bushing plate.

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You now have possibilities unlimited for lowest cost per drilled hole! And, if your machines have a reversing spindle, you can *drill and tap with the same head!*

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For descriptive data, ask for Catalog AD-57.

Style U-2 Head drilling housing flange. Inset shows "tool crib" of drills and slip spindle plates used with this head on 17 other setups.

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- **5** Different Styles
- **2** Types of Ball Bearing Retainers
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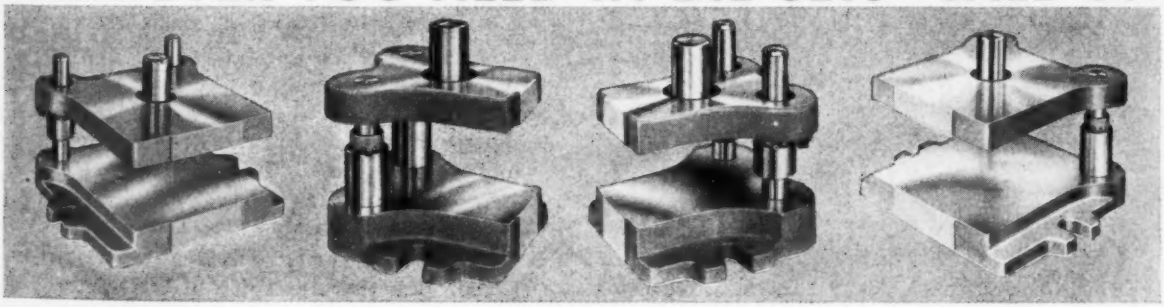

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CIRCLE INFORM-A-GRAM KEY NO. 9

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Extensive billet stocks enable A-L to save valuable time in processing your orders. Billet stocks include 68 grades of A-L tool steels, 50 grades of Allegheny Stainless, A-L high temperature alloys, and 20 grades of SAE steels. Over 2½ million pounds in stock. And billet stocks can be renewed quickly by shipment from stocks in other Allegheny Ludlum plants.

In addition to providing an extensive billet stock, A-L can help you out of tough spots in other ways. To save you time in emergencies, they'll often forge round, hex, or rectangular bars up to 120 inches long. And when you need just a few pieces or can't wait for the sinking of drop forging dies, A-L hammer craftsmen are often able to turn out your special shapes that resemble drop forgings.

For more information on the characteristics and size range of A-L forgings, refer to FC4, a 28-page technical discussion of A-L's Forging and Casting Division. It also includes information on **Cast-To-Shape** tool steels and **Composite Die** sections. Ask your A-L salesman for a copy, or write: ***Forging and Casting Division, Allegheny Ludlum Steel Corporation, Ferndale, Detroit 20, Michigan. Address Dept. TP-12.***

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FORGING AND CASTING DIVISION

CIRCLE INFORM-A-GRAM KEY NO. 10

NIKON OPTICAL COMPARATOR

new model 3A offers unusual screen brightness and image resolution – features zoom-condenser system

The unusual image brightness, definition and accuracy achieved in the new model 3A—to the very edge of the screen—is a credit to the quality and design of its optical system.

The new Nikon model 3A permits surface as well as contour inspection—independently or simultaneously. And controls are provided for adjusting the intensity of each of the illuminators.

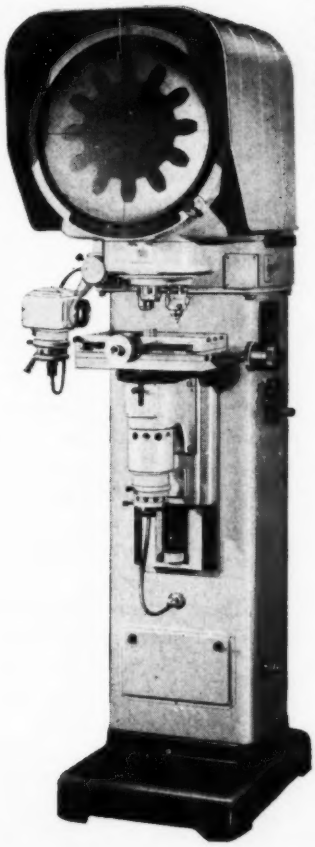
The surface illuminator may be used obliquely to emphasize surface texture. Or, for greater measurement accuracy, the surface illuminator may be used in conjunction with lens-mounted, half-reflecting 45° angle mirrors to provide shadowless light on the optical axis. Contour illuminator employs a special zoom condenser matching system. Convenient control simplifies adjustment for optimum illumination at each magnification.

Model 3A is normally supplied with a choice of one or more standard lenses in magnifications ranging from 10x to 100x. Other magnifications are also available on special order. A 3-lens turret supplied as standard equipment, facilitates instant changes. Focusing is smooth and effortless. Utilizes leadscrew drive with scraped ways and adjustable gibs.

The model 3A is equipped with a sliding hood which may be drawn out to shade the screen, or can be retracted to permit ready access to chart or screen surface. The overall diameter of the screen glass is 14½", designed for use with standard charts.

The new Nikon 3A accepts a wide variety of micrometer stages, holding fixtures, protractor screens, charts, photo attachments, and other accessories. For details write Dept. TP-12.

features new 14" screen



NIKON INCORPORATED Instrument Division 111 Fifth Avenue New York 3, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 11

These Springs MUST Work! Associated Spring Makes Sure with STEREOZOOM® MICROSCOPES

These atomic reactor emergency shutdown springs, made by the B-G-R Division of Associated Spring Corp., *must* work in case of trouble. That's where Bausch & Lomb StereoZoom Microscopes come in. Their vivid 3-dimensional magnification detects any irregularity in the uniform chromium-plated finish . . . seeks out tiny nicks and gouges that could cause malfunction. Each of these "scram springs" must be perfect . . . and B&L StereoZoom microscopy helps make *sure*.

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There is a broad selection of B&L StereoZoom Microscope models to meet all your inspection and assembly needs. It will pay you to find out how they can help "make *sure*" in your precision operations.

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CIRCLE INFORM-A-GRAM KEY NO. 12

Talk of the Month

Delayed Patent Infringement Suits

by Albert Woodruff Gray

We are digressing from the usual excerpts from a talk, and present Mr. Gray's account on patent infringements. Your past interest in patent information motivated us.

SIX PATENTS RELATING to welder control devices were issued to and acquired by a large manufacturer. Four years later the firm sent a letter to the welding trade stating: "We own the following patents, among others, relating to control systems for welding apparatus.

"These patents include certain claims applicable to control items sold by us and certain additional claims applicable primarily to complete resistance welding equipment sold by welding machine manufacturers and not by the company.

"In order that you may understand our policy with respect to patent infringement, we take this means of assuring you that we have no present intention of asserting any claims in the second category, that is, claims of the above patents applicable primarily to complete resistance welding equipment sold by welding machine manufacturers, against such manufacturers or their customers.

"While it is our hope and expectation that we shall be able to continue this policy, we recognize the possibility that future business conditions may require some change. If such condition should arise you will, of course, be given ample notice of any change proposed and in any event no such change would apply to equipment manufactured prior to such notice."

Already in Use

Before this letter, one manufacturer of welding control devices, had inaugurated an extensive busi-

ness in three phase welders. It placed the manufacturer ahead of his competitors.

Eight years after the patentees had sent this letter, they sued the infringing manufacturer, charging patent infringement. The defense rested on delay in action and the consequent forfeiture of the right of the patent-owner to either an injunction against this infringement or to damages.

Delays are Costly

There are cases where the patent owner had become suspicious and convinced of the infringement, but did not institute action until 10 yrs later. Such delays, the courts will point out, may well be fatal to a recovery. They say the infringer has been lulled into a false sense of security, and spent large sums in developing and marketing the product.

"A court of equity will refuse relief after unexcusable delay because of the difficulty, if not impossibility, of arriving at a safe and certain conclusion as to the truth of the matter. If the evidence has been lost or become obscured through the loss of documents or through the death or disappearance of one or more of the participants or of the witness, it is difficult for the courts to decide for the plaintiff.

No Stale Demands

The U.S. Supreme Court established this doctrine during the first half of the past century when it asserted:

"The established doctrine of the law of courts of equity is that it will not entertain stale demands. A court of equity which is never active in relief against the conscience or public convenience, has always refused its aid to stale demands where a party has slept upon its rights or acquiesced for a great length of time."

Restatement of this rule was made recently in a denial in an infringement suit against a movie producer, based on a patent whereby a still background scene is photographed with superimposed action in the foreground.

"We think it is self evident," said the court in dismissing this infringement action, "there must be

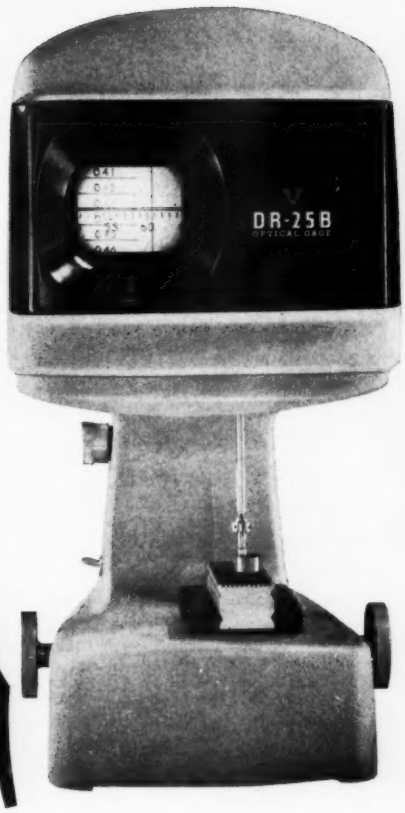
. . . Continued on page 18

ONE...
just set the part on the anvil (no masters or set gages needed)

TWO...
turn the knob to lower spindle (stops automatically on contact)

THREE...
read the measurement directly from the scale (and save up to 85% in gaging time!)

MEASURE TO .0001"!



. . . that's how quick and easy it is with the Bausch & Lomb DR-25B Optical Gage!

Takes just seconds to get direct readings to .0001" . . . depth, thickness, height, diameter, taper. You read in "tenths" from 0" to 3" on a bright, magnified scale . . . with such extreme accuracy (0.000025") that masters or set gages are unnecessary. Specially calibrated to normal shop temperatures with easy conversion charts for any temperature fluctuation. Here's today's fastest, easiest way to get highest accuracy readings . . . with job-proved savings of as much as 85% in gaging time . . . for only $875!
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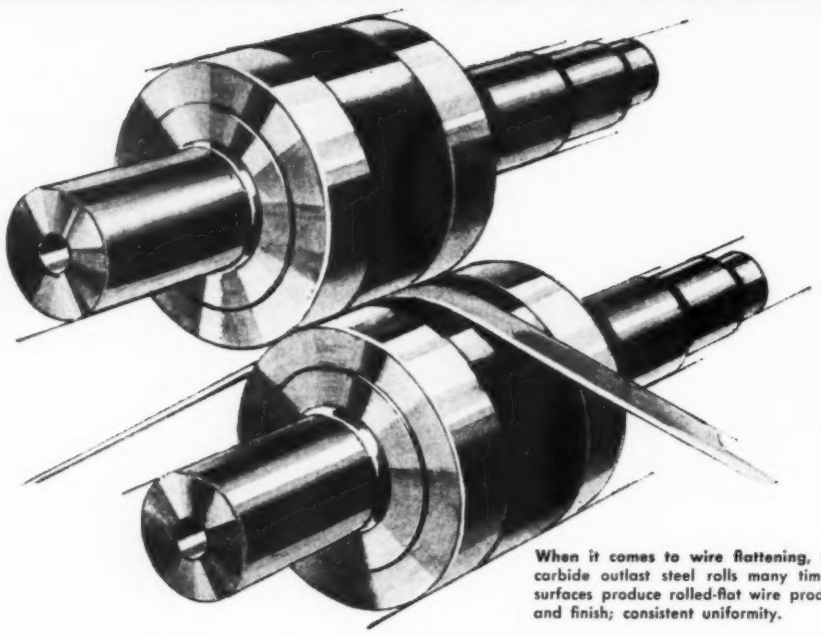
CIRCLE INFORM-A-GRAM KEY NO. 13

"MOVING METAL" with Carboloy® Cemented Carbides

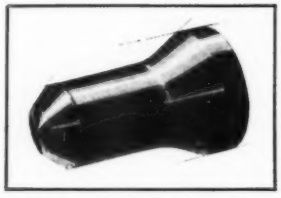


When it comes to wire flattening, rolls of Carboloy cemented carbide outlast steel rolls many times. Smooth, wave-free roll surfaces produce rolled-flat wire products of exceptional quality and finish; consistent uniformity.

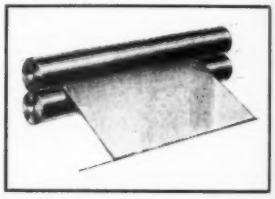
Reduce costs, save machining time with Carboloy® cemented carbides

How efficiently you "*move metal*" from one shape to another depends on the quality, accuracy and uniformity of the carbide you use. General Electric Carboloy carbides for coining and extruding punches, wire-flattening and sheet metal rolls are designed to do the job better, in less time, at lower cost, with less metal waste.

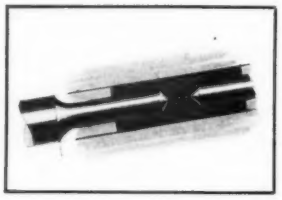
Continuing research by General Electric's metallurgists and technicians results in carbides of highest quality and uniformity — dependability for the job at hand. Call your Carboloy Die Distributor or Die Maker to help you "*move metal*" at lower cost. Or write: *Metallurgical Products Department of General Electric Company, 11111 E. 8 Mile Street, Detroit 32, Michigan.*



Cold extrusion punches made of G-E carbides find a wide variety of applications. For example, in the production of bearings, a solid carbide punch forms a race and cup from one steel slug—minimum waste; saves machining.



You get uniform, more even sheet when you use rolls of Carboloy cemented carbides. Roll structure is uniform throughout; excellent for working stainless steel. Carboloy rolls last longer and do jobs not possible with steel rolls.



From solid slug to wrist pin— 2,000 an hour! Increased production is but one of the advantages when you use extruding and coining punches of Carboloy cemented carbides. You get uniform weight, surface finish, improved strength in the part produced.

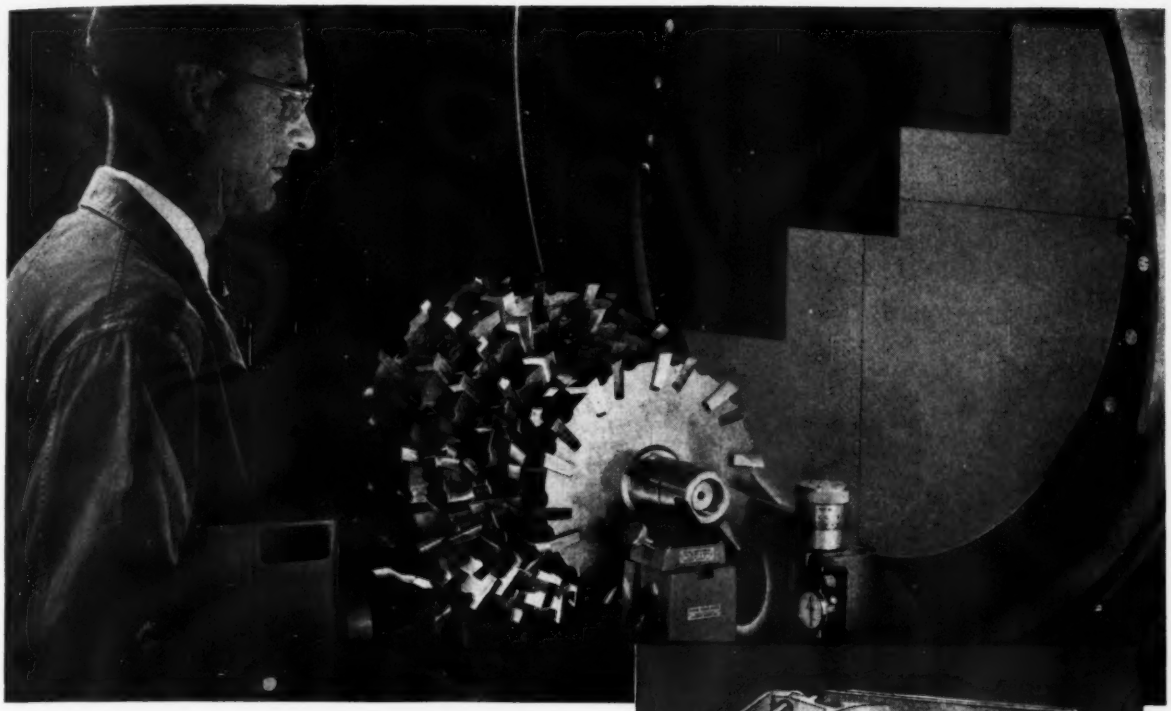
CARBOLOY® CEMENTED CARBIDES

METALLURGICAL PRODUCTS DEPARTMENT

GENERAL ELECTRIC

CARBOLOY® CEMENTED CARBIDES • MAN-MADE DIAMOND • MAGNETIC MATERIALS • THERMISTORS • THYRITE® • VACUUM-MELTED ALLOYS

CIRCLE INFORM-A-GRAM KEY NO. 14



Built by EX-CELL-O

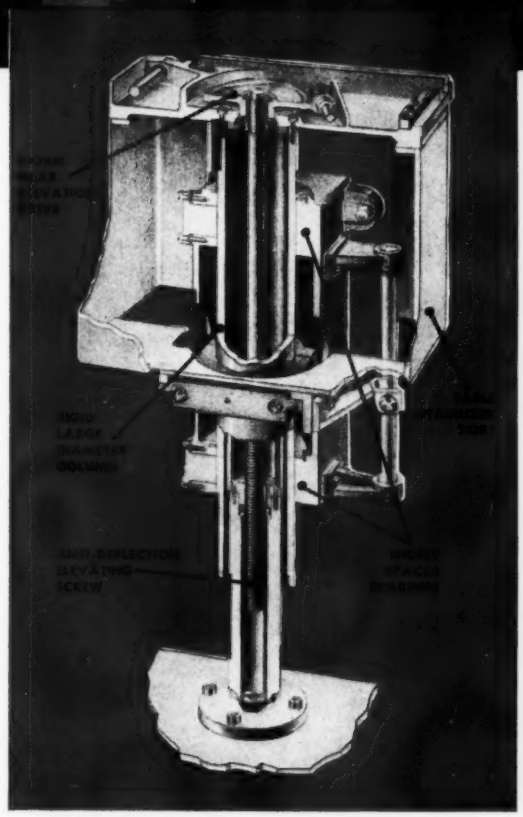
To Insure Accuracy

Rugged, precision construction of Ex-Cell-O Contour Projectors results in stable support for the optical systems providing accuracy in the order of .0001″. This rigidity is a major consideration in achieving for Ex-Cell-O Projectors an outstanding record of trouble free operation and almost total elimination of down time.

Typical of the sturdy, precision workmanship to be found throughout Ex-Cell-O Contour Projectors is the worktable of the Model 14-5 and Model 30. Engineers will recognize the superior design features shown in the inset at right. To cite just a few, the large 5″ O.D. columns, supported in widely spaced bearings; the heavy channel skirt to stabilize the table assembly and the flexible elevating screw which can't impart deflections to the column.

Because of these construction features Ex-Cell-O Contour Projectors support heavy loads firmly, yet move easily and smoothly.

Whether your problem involves receiving, production or final inspection there's an Ex-Cell-O Contour Projector to do the job accurately, quickly and at low cost. The "why" and "how" is condensed in our new booklet—"43 Reasons Why Ex-Cell-O Contour Projectors are the First Choice of Industry." Yours for the asking!



Manufactured by EX-CELL-O Corporation at Detroit, Mich.

SOLD AND SERVICED BY

CP61-2

OPTICAL GAGING PRODUCTS, INC.

26 FORBES STREET ROCHESTER 11, N. Y.

Subsidiary of EX-CELL-O Corporation

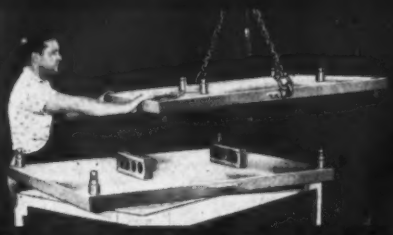
CIRCLE INFORM-A-GRAM KEY NO. 15

a flick of an allen wrench parts a SUPERIOR DIE SET

REMOVABLE CAP GUIDE PINS END BINDING IN PARTING DIES

Allen wrench loosens the socket head screws — the removable caps are pushed up through the bushings . . . then the punch holder virtually floats on the guide pins. That makes it a simple matter to lift the punch holder off the die shoe. Tilting or uneven lifting is not a factor when removable cap pins are used.

Now on all SUPERIOR die sets in diameters from 1½" upward at no additional cost.

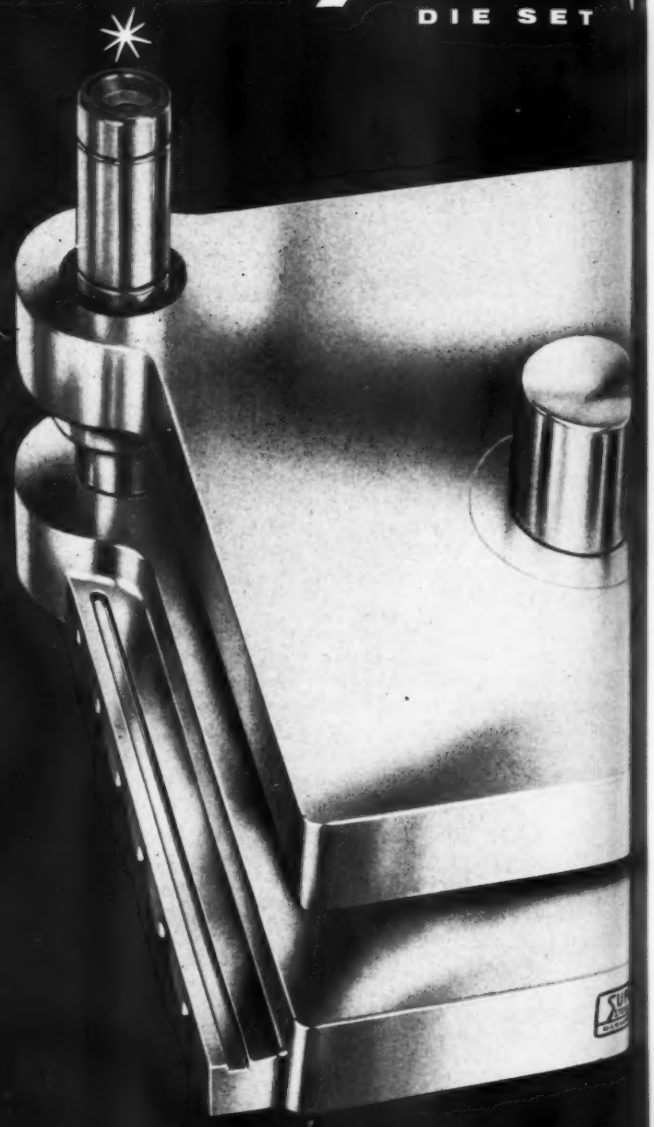


One man parts large die set in a few minutes with Superior Removable Cap Guide Pins.

No Die Set Smash-Ups
Should foreign matter cause pin and bushing seizure, the socket screw pulls out of retaining washer . . . then the matching taper of pin and cap act as guide to prevent costly die damage.

WRITE FOR CATALOG

THE *Exclusive* SET



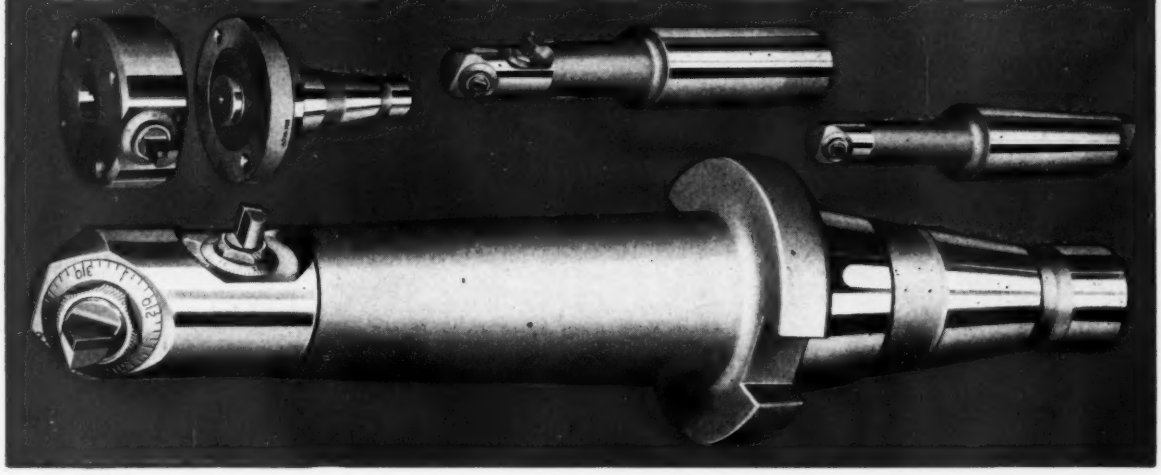
SUPERIOR DIE SET CORP.

2754 South 19th Street · Milwaukee, Wisconsin
Cheshire, Connecticut

FROM DEVLIEG

microbore® precision tooling center

MICROBORE



Imitated but never equaled, MICROBORE is the single point tooling system with micrometer vernier adjustment. Designed for all boring, turning and facing operations, the basic MICROBORE system includes over 300 standard single point tools from stock with carbide, ceramic and high speed steel tips • special cluster tooling • Flash-Change tooling • adjustable blade facing heads • tooling with Kendex "throw-away" inserts. And not just a product line, MICROBORE is a complete service comprised of well schooled sales engineers, tool design engineers, highly specialized plant facilities, field service and tool maintenance. Write for complete information.

DEVLIEG MICROBORE • DIVISION OF DEVLIEG MACHINE COMPANY • FAIR STREET • ROYAL OAK, MICHIGAN

MICROBORE • PRECISION TOOLING CENTER

DEVLIEG MICROBORE SYSTEM

CIRCLE INFORM-A-GRAM KEY NO. 16

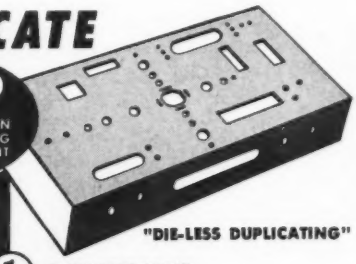
CIRCLE INFORM-A-GRAM KEY NO. 17

. . . Month's Talk from page 13

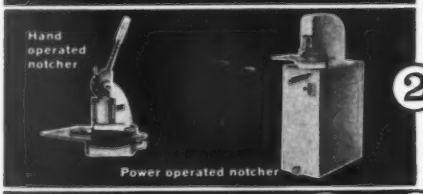
some detriment to a person investing millions in any product if an alleged inventor of that product delays for some fifteen years after knowledge, in bringing suit. His right to bring suit at any time during the patent's existence is not questioned. We merely suggest there must be some detriment to the alleged infringer by reason of substantial unexplained delay.

"It is the general rule that one cannot have knowledge of an alledged infringement and then stand idly by while the infringer embarks on a costly expansion program. Here passage of time cannot constitute laches but if the passage of time can be shown to have lulled the alleged infringer into a false sense of security and he acts in reliance thereon, laches may, in the discretion of the court, be found."

HOW TO FABRICATE
in model shop
or production with di-acro PRECISION METALWORKING EQUIPMENT

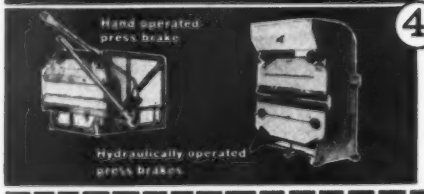


1 **SQUARING**
Power shear blanks to die accuracy at high speed—up to 16 gauge mild steel. Heavy duty construction for efficient, accurate and trouble free performance at all times.



2 **NOTCHING**
Notcher cuts up to 6" x 6" in 16 gauge mild steel in one operation. No expensive dies, no punch press set-up—just set the gauges and toe the switch.

3 **PUNCHING**
OBI 5-ton punch press—single or automatic cycling—up to 210 strokes a minute. It's accurate and easy to set up. Safe to operate no special skills needed.
Use Di-Acro adjustable and single station punches and dies.



4 **BRAKING**
Hydraulic powered press brakes give full control. Dual speed cycle . . . fast approach and return—safe work speed. Ram may be inched or reversed at any point in the stroke. Available in 12 and 25 ton models.
Use Di-Acro standard and Rol-Form press brake dies.

pronounced "die-ack-ro"

DI-ACRO CORPORATION
(formerly O'Neil-Irwin Co.)
9412 Eighth Avenue • Lake City, Minn.

Please send Di-Acro catalog on complete line of metalforming equipment.

NAME_____
ADDRESS_____
CITY_____ STATE_____

CIRCLE INFORM-A-GRAM KEY NO. 18

Severity towards Sleepers

Recently the courts have been more stringent toward patent owners who slept on their rights for years, and then act after the infringer has invested large sums of money in good faith in the project the patent owner thus wantonly seeks to destroy.

A patent was issued for an igniter for use with gas, oil or vapor engines. After successive assignments by several intermediate holders, an infringement suit was brought more than 10 yrs after patent issuance. By then the igniter had been sold in large quantities in the open market.

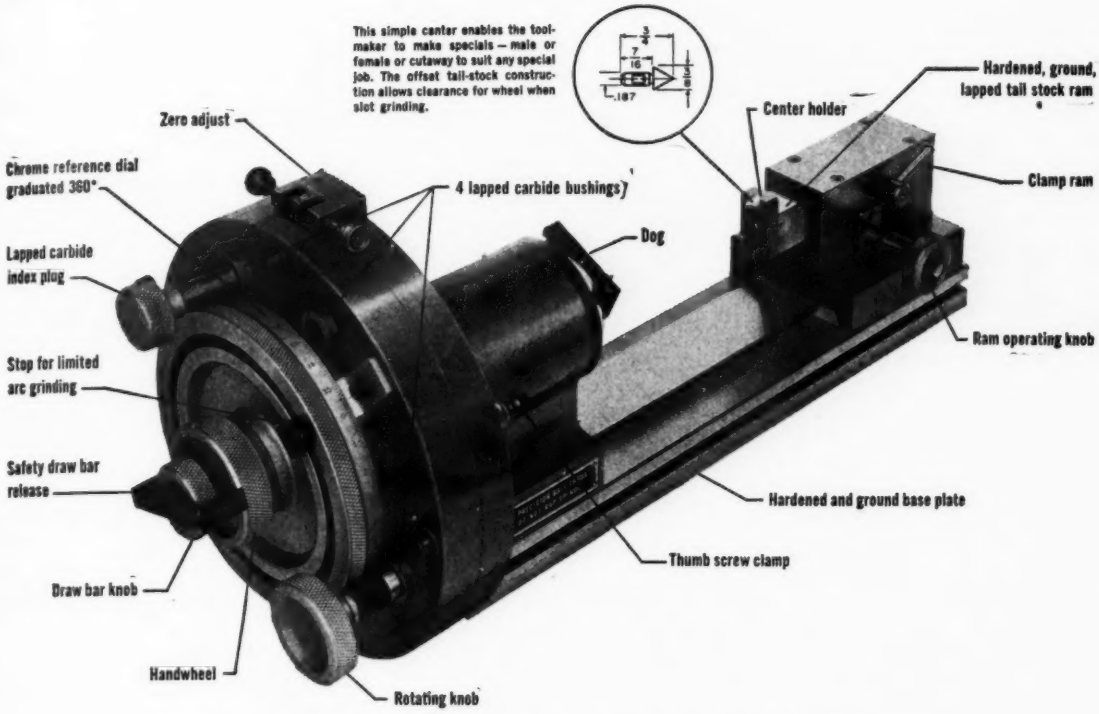
Injunction against further infringements was granted. However, no accounting could be decreed that patent owner for the profits from sales during patentees indifference.

"None of these successive holders," said the Federal Court of Appeals, "made any sale of the patent except that the patentee made two or three for use in his own pleasure boat. None of them manufactured any of these nor did they procure any of them to be manufactured, nor did they sell any, nor did they, as far as appears, make the slightest effort to induce anyone engaged in the automobile industry, to make items on some basis of royalty.

"The infringement was not an act done in a corner. Had the owner taken the trouble to send a competent man to the storerooms of a few dealers in automobile supplies of this sort, or to any of the periodical automobile shows where manufacturers send their devices and point out their claimed advantages, there can be little doubt that infringement would have been discovered years ago."

Warning Infringers

"An advertisement in some of the trade papers to the effect that the owners of the patent would prosecute infringers, would have warned the trade that this patent was not, by its owners, regarded as a thing of no account in which they took no interest. It might well be that had some such announcement been made, infringing manufacturers would long ago have modified their devices so as to avoid infringement, as they could easily do." ■


This simple center enables the toolmaker to make specials — male or female or cutaway to suit any special job. The offset tail-stock construction allows clearance for wheel when slot grinding.
Zero adjust
Chrome reference dial graduated 360°
Lapped carbide index plug
Stop for limited arc grinding
Safety draw bar release
Draw bar knob
Handwheel
Rotating knob
4 lapped carbide bushings
Dog
Center holder
Hardened, ground, lapped tail stock ram
Clamp ram
Ram operating knob
Hardened and ground base plate
Thumb screw clamp

Save time, money and effort with the practical

MOORE PRECISION INDEX CENTER

The versatile Moore Index Center is a handy precision tool with tolerances that compare to the reputable Moore Measuring Machine. It is an instrument that will improve the facilities of any toolroom, or precision parts maker, when applied to:

1. Inspection of work on centers.
2. Jig boring, milling, and jig grinding work on centers.
3. Form grinding—spiders, splined punches, gear die punches and dies, sectional parts of dies where revolving the part on centers or in a spindle is necessary.

To give you an idea of how it achieves peak precision, and gets its work done quickly, examine the following Moore Index Center's special features:

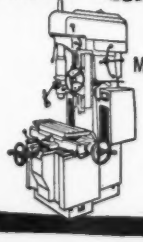
1. Special ball construction spindle; lapped-fit, 192 balls with ±.000005" (5 millionths) tolerance under load. Runs true to .000015" (15 millionths) T.I.R.
2. Lapped Carbide Index Plug and 4 lapped-fit carbide Plug-in-Stations, 0°, 45°, 90°, 180°*.
   24-hole hardened and jig ground index plate accuracy of spacing ±5 sec.
3. Accurately adjustable tail stock. Center line-up is maintained with lapped-fit ram movement of center.
4. Headstock uses "Moore Shank."
5. Sealed against dirt, it can also be used in wet grinding.

**Extra plug-in-station allows the user to turn his workpiece exactly 180° at any time to get his cut on dead center. It can also be used to re-orient for a different set of angles on the same workpiece.*

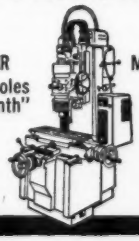
Write today for illustrated folder giving details, including specifications—

***Moore Special Tool Co., Inc.,** 726 Union Avenue, Bridgeport 7, Connecticut*

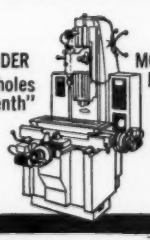
ONLY MOORE TOOLS CAN OFFER THIS COMPLETE PACKAGE OF PRECISION



MOORE No. 3 JIG BORER
Locates and bores holes to less than a "tenth"



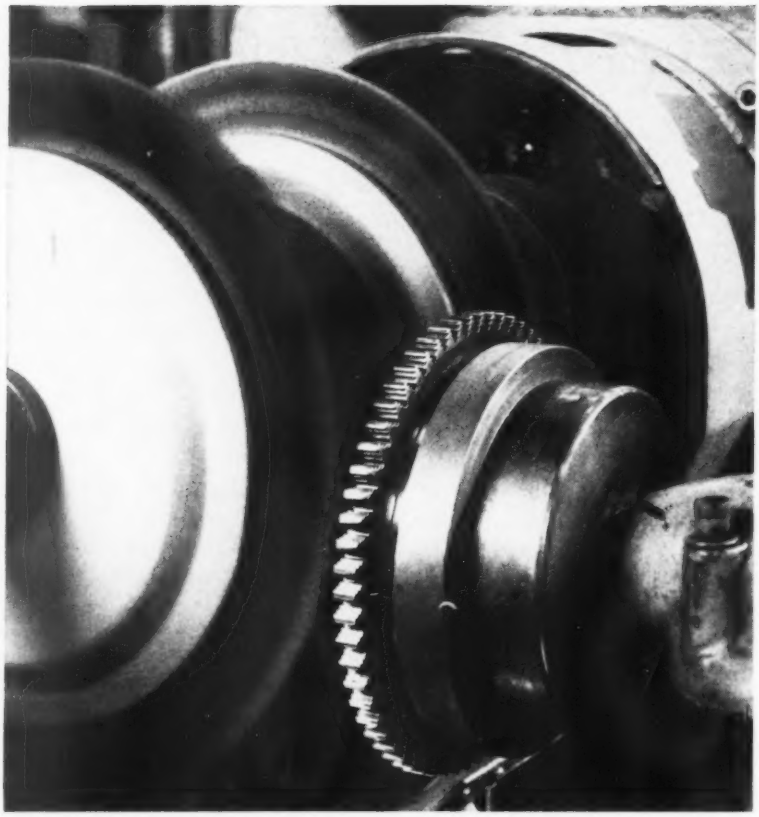
MOORE No. 3 JIG GRINDER
Locates and grinds holes to less than a "tenth"



MOORE UNIVERSAL MEASURING MACHINE
Measures to one-third of a "tenth"

MOORE ROTARY TABLE
Divides the circle to less than 2 sec.

CIRCLE INFORM-A-GRAM KEY NO. 19



GAS TURBINE DISC DOVETAILS are deburred rapidly, automatically on Osborn 3A Finishing Machine using Osborn 14" Tufmatic® power brushes. Cycle time—floor to floor: 5 minutes . . . *9 times faster than former method.*

COST CUT 90% deburring with OSBORN power brushing

Before: deburring the 64 dovetails broached on this gas turbine disc was a problem for this major producer of jet engine components. Off-hand filing was slow and costly . . . took 45 minutes per part . . . cost about $5.00 per disc.

Now: an Osborn 3A Finishing Machine—equipped with two Osborn Tufmatic® power brushes—deburrs the part automatically in just 5 minutes . . . *9 times faster.* Finishing cost is down to 50¢ per part . . . *a 90% cost reduction.* And production quality is consistently higher, more uniform.

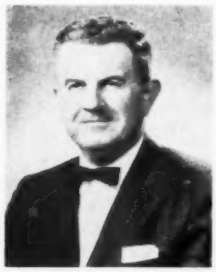
Osborn power brushes and advanced brushing methods can help *you* same time and money on metal finishing operations of every description —deburring, cleaning, polishing, precision blending. An **O**sborn **B**rushing **A**nalysis—made at no obligation in your plant now—is the first step to savings like these. Write or call *The Osborn Manufacturing Company, Dept. L-10, Cleveland 14, Ohio. Phone ENdicott 1-1900.*

OSBORN

Metal Finishing Machines . . . and Finishing Methods
Power, Paint and Maintenance Brushes • Foundry Production Machinery

CIRCLE INFORM-A-GRAM KEY NO. 20

'An Open Door To New Business' —Stauffer



Despite the best sales efforts, the best salesmen and field engineers, many prospects would escape the sales dragnet without the services provided by specialized business-publications.

In the language of the trenchcoat and slouch hat school of private eye-ing, "Somewhere out there, an unknown prospect is waiting." He must be found before the competition gets to him. And, he must be told who you are, what you do, and how you can help him.

Through specialized business publications, your sales messages get to those prospects. Besides being a trading station for the exchange of ideas, know-how and technical information, these publications are read thoroughly. The degree of response from any given readership will show him where to concentrate maximum sales effort.

In no other way can a company improve its sales picture on such a large scale. True, direct sales calls by a large number of expert salesmen could eventually develop the same information but, if you are selling to a large market that is widely distributed geographically, there are practical limitations.

Certain limitations also apply when you have a diversity of products and/or services to offer. The Yoder Company, for example, manufactures a substantial variety of metalworking equipment which, by its nature, finds application in many different manufacturing operations. To ask our sales representatives and engineers to keep abreast of all the possible applica-

. . . **Continued on page 22**

CAPABILITY

Total machine *capability* is what counts in the toolroom. That's why the NEW 1307T is so popular. Its capability can be measured in profit, production, versatility, and convenience . . . as well as in accuracy, service, capacity, and ease of operation. Stepless, electronic speed changing improves efficiency and finish. Larger and a greater variety of parts can be machined. The bed is longer, the swing is greater, and the compound rest has more travel. Electric dynamic spindle braking, extra-large spindle bore, feed rate of .001 ipr,* and quick-change gear box controls all give the 1307T greatest TOTAL CAPABILITY in its class. Literature and prices on request.

*.0002 ipr with change gears

BARBER-COLMAN COMPANY

BARBER COLMAN

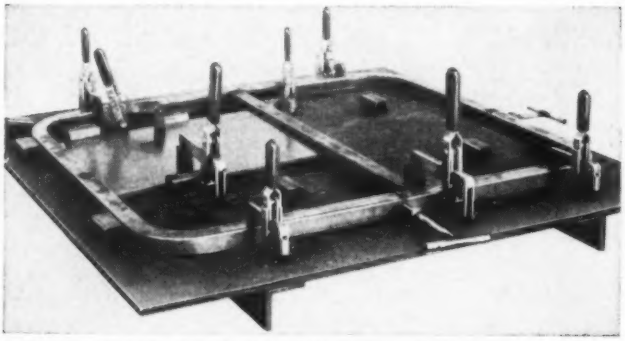
127 LOOMIS STREET, ROCKFORD, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 21

YOU CAN HAVE PRE-PLANNED PRODUCTION

WITH DE-STA-CO TOGGLE CLAMPS

De-Sta-Co makes it easy to pre-plan production jigs and fixtures right on the drawing board! Detailed tracing templates, in full and half size, can be slipped under a drawing and spotted accurately—saves design time, speeds fabrication! Choose from over 140 models, there's a clamp for every job.



Steel welding fixture with 8 De-Sta-Co Model 267 Toggle Action Clamps holds parts securely during fabrication.

HOLDING PRESSURES FROM MERE OUNCES TO 16,000 POUNDS
FOR DETAILS—ASK FOR NEW 36-PAGE CATALOG

TOGGLE CLAMPS
SHIMS AND SPACERS
DE-STA-CO
STAMPINGS
BLOWER HOUSINGS

DETROIT STAMPING COMPANY
340 MIDLAND AVENUE • DETROIT 3, MICHIGAN
CIRCLE INFORM-A-GRAM KEY NO. 22

. . . Open Door from page 20

tions and, in doing so, develop new business, would be both unrealistic and unfair.

Although a good salesman will do his best to uncover prospects on his own, he cannot hope to cover every possibility. He is a specialist whose energies can best be utilized in direct contact with existing customers and serious prospects. His real selling job begins after the prospect has made himself known.

Nor is there any other way to communicate directly with large numbers of potential customers who might be interested in new developments. When the time comes — when new products are ready to be introduced — we will want to tell as many people as possible, in the quickest way possible. To do that, we will rely heavily on trade and business publications to carry our messages.

By 1970, for example, total research spending in the U.S. is estimated in the neighborhood of $20-billion to $25-billion. These figures represent the eventual development of a tremendous number of new materials, new or refined products, tools and equipment that will move into the market.

We're crossing many industrial and technological frontiers . . . and creating new ones every day. It's no mere coincidence, therefore, that our specialized business press plays such a vital part in our technological development and in our economy.

For, here is where the day-to-day industrial accomplishments are recorded. And here is where we look for, and find, the markets upon which those accomplishments are based.

O. B. Stauffer is an executive with The Yoder Co., Cleveland, Ohio. The foregoing was excerpted from a statement he made at a recent National Business Publishers' meeting. It's brief and to the point, and we thought you might like to consider his ideas about our "product." — WEH, editor.

BUY
U. S. SAVINGS BONDS

WHERE 10 WILL GIVE YOU 100

Burnerd's new Multisize Collet System—in which each collet has a stepless gripping range of ⅛"—actually replaces conventional collets in the ratio of one for ten! Here's what you get:

- ACCURACY to within .0005" at collet nose—unobtainable with any other collet.
- ALL STEEL CONSTRUCTION—assures unmatched accuracy and gripping power throughout long, trouble-free service life.
- GRIPPING VERSATILITY which is infinitely variable—from maximum for heaviest torque loads and end thrusts to minimum for soft and fragile materials. Precision ground blades, set radially in tapered body, grip work along their entire length.

Burnerd key-operated collet chucks, dead-length lever collet chucks, table mounting chucks, and tool holders—combined with Multisize collets—produce a "shop-wide" system that is highly accurate, efficient, and economical. Get the full story on how "ten will give you a hundred!" Write for detailed literature today.

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BURNERD COLLETS

CLAUSING DIVISION
ATLAS PRESS COMPANY
12-218 N. PITCHER ST. • KALAMAZOO, MICH.

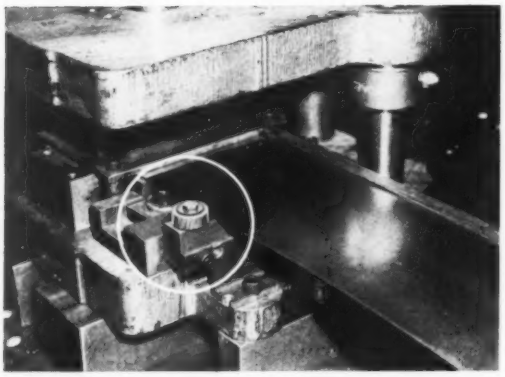
CIRCLE INFORM-A-GRAM KEY NO. 23

Practical Tooling Tips

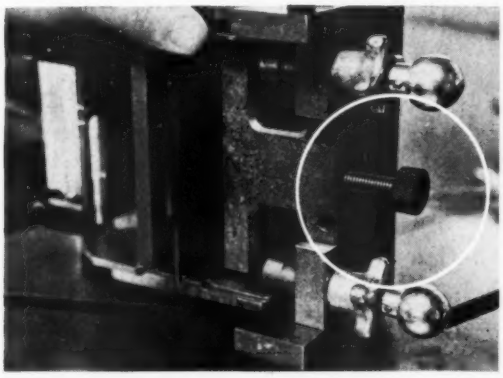
No. 5 of a Series

You benefit three ways from Vlier jig and fixture components. First, you eliminate design of custom devices, freeing tool designers for more important assignments. Second, you free costly machines for more profitable work. Third, by eliminating machining time you speed completion of jigs and fixtures.

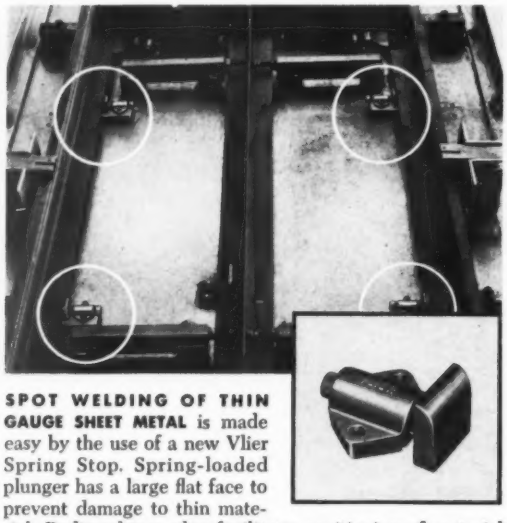
Thousands of shops are now benefiting from low cost Vlier components in applications such as the ones shown below. Why don't you?



SAVE DIE PILOTS by using this simple, compact Vlier Stock Pusher to align stock in dies and fixtures. Accommodates materials as thin as .010"; width variations totaling 1/16" Requires only a single tapped hole to mount; easily removed when die needs sharpening.



ELIMINATE HOLDING PRESSURE GUESSWORK in jigs and fixtures by securing parts with Vlier Torque Thumb Screws. Once predetermined end pressure is reached, knurled head rotates freely. Prevents deflection of thin-walled parts, assures accurate machining. Four models, various sizes and end pressures.



SPOT WELDING OF THIN GAUGE SHEET METAL is made easy by the use of a new Vlier Spring Stop. Spring-loaded plunger has a large flat face to prevent damage to thin material. Radiused top edge facilitates positioning of material in fixture without binding or crimping. Die cast aluminum body weighs only one third ounce. Ten pounds end pressure.

FREE IDEA BOOKLET—16 pages crammed with photographs showing how others have profited by using Vlier tooling components. Your Vlier distributor will be happy to supply a copy, or if you prefer, write directly to us.

VLIER
Engineering Corporation
A subsidiary of Barry Wright Corporation BW
8900 Santa Monica Blvd. • Los Angeles 69, California

CIRCLE INFORM-A-GRAM KEY NO. 24

UNIVERSAL R & R DEBURRING TOOLS

with spring-loaded retractable blade give precision-cut edge or chamfer at high speed without chatter

Adjustable spring tension allows continuous contact with work-piece to eliminate chatter at high operating speeds. Free-floating blade permits self-alignment and uniform stock removal. Made in a full range of sizes to 1½" diameter.

Blades of the Universal R & R Deburring Tool are made of high speed steel, precision hardened and ground to close tolerances for interchangeability. May be used as horizontal deburrer in portable electric drill or in standard drill press.

For full information, write to Universal Engineering Company.

Write today for complete catalog of Universal Engineering products.

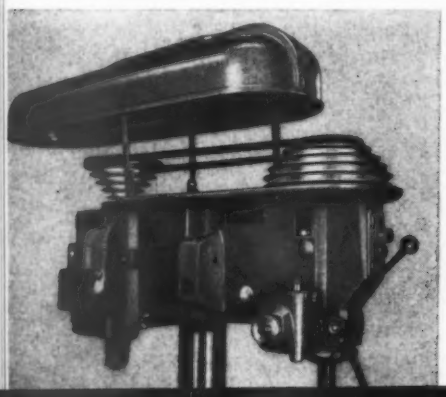
216

UNIVERSAL ENGINEERING COMPANY • FRANKENMUTH 8, MICHIGAN

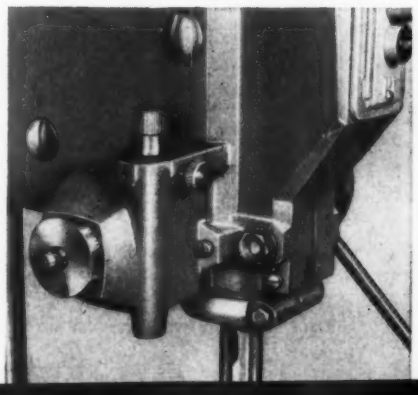
CIRCLE INFORM-A-GRAM KEY NO. 25

ALL NEW Capacity—Equipped with exclusive Rockwell Power Feed (tested through 750,000 drilling cycles) the all new 17″ drill presses handle many production jobs ordinarily done by costly, fixed equipment. In addition, they offer portability that can be utilized to perform extra drilling operations on limited runs or to relieve production line bottlenecks.

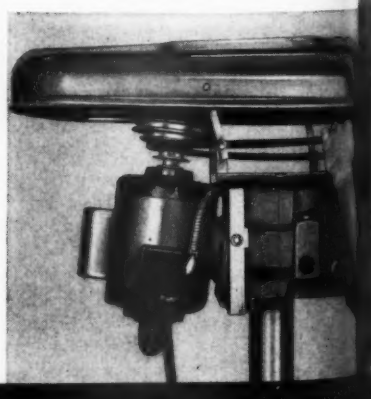
ALL NEW Interference-free Guard—Tilts up and back out of the way giving operator plenty of room to make belt and speed changes quickly, easily. Three specially designed supports and a stop hold steel guard in "up" position, built-in clips automatically lock guard in operating position when closed.



ALL NEW Internal Depth Stop Mechanism—A new concept in depth stops that eliminates bottom-of-stroke quill deflection which causes excessive drill breakage and downtime. Convenient adjustment knob permits fast, one hand operation, locks in position to stop pinion shaft at same depth through repeated cycles.



ALL NEW Pivot-type Motor Mount—Assures full release of belt tension before changing from one pulley speed to another, delivers longer belt life and eliminates possibility of damage to the belt. Maintenance of proper running tension on belt at all times prevents undue wear on bearings.



You can do more with these

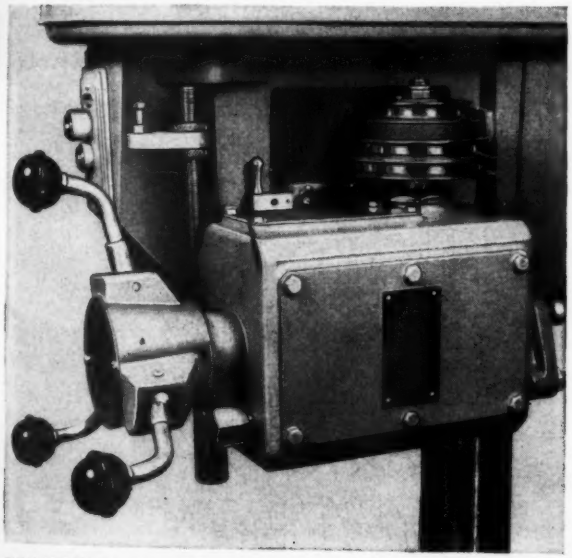
ALL NEW DELTA 17" DRILL PRESSES

Here is a major engineering advance from Delta to give you increased drilling accuracy, more job flexibility and greater operating economy. You can choose the machine best suited to your needs from 76 models in a complete line of 17" drill presses that incorporate the most up-to-date performance features available.

These drill presses are completely new—not merely improved or re-styled—but actually re-designed to deliver consistent precision operation under the most rugged work loads with little or no maintenance.

With the introduction of this all new 17" drill press line, Delta continues to provide the high quality of product that has made it the leading name in drill presses for over 31 years. Your Delta Industrial Distributor (listed under "TOOLS" or "MACHINERY" in the Yellow Pages) will gladly demonstrate how these 17's can save you dollars, hours and material. Why not call or see him soon!

FREE BROCHURE—Complete specifications and details on the full line of all new 17" drill presses and accessories. Simply write: Rockwell Manufacturing Company, Delta Power Tool Division, 622M N. Lexington Ave., Pittsburgh 8, Pennsylvania.



ALL NEW Rockwell Power Feed—Available as original equipment or as an accessory on every model, this advanced development in mechanical power feeds gives you: a front mounted pilot wheel for one hand operation and "flick of the wrist" control of feeding; infinitely adjustable drill point pressure and a built-in feature that permits remote control. For semi or fully automated operations, power feed can be electrically, hydraulically, pneumatically or mechanically interlocked with other machines.

CHOOSE FROM 76 MODELS

Selection includes: floor, bench or multiple spindle machines equipped with standard or production table, standard or Rockwell Power Feed, key chuck or tapered spindle, high or slow speed.

DELTA INDUSTRIAL TOOLS

another fine product by

ROCKWELL

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10 WAYS TO GRIND AT LOWER COST...

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Precision built for secondary grinding operations on lathes, millers, planers, shapers, grinders, boring mills to save handling, moving, set-up and down-time. Easily adapt to bench use or special machines. Deliver accuracy to .0001″, surface finishes to 6 micro-inches. Easy, simple mounting and use by regular machine operators. 9 models, 1/14 to 3 hp., swing 1/8″ to 12″ wheels. Priced from $93, FOB Racine.

DUMORE® PRECISION GRINDING TOOLS

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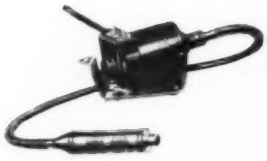

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hand grinding at its best
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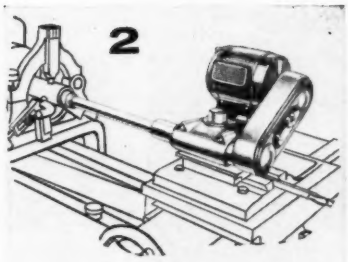
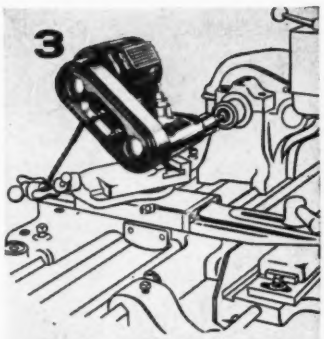
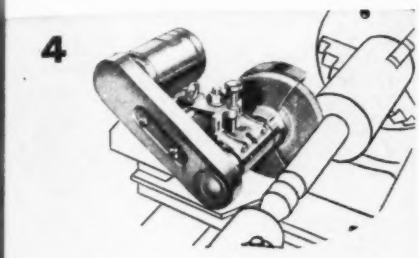
small diameter external grinding
precision to within .0001″



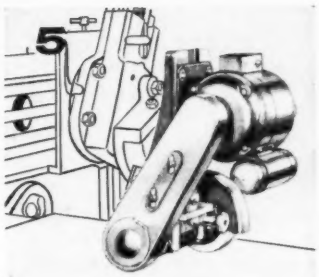
deep hole internal grinding
with Dumore internal grinding quills to depths up to 24″



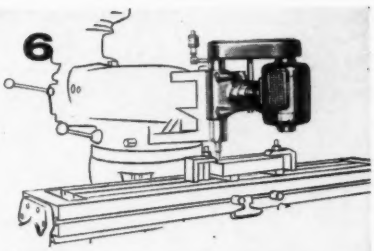
small hole internal grinding
down to 1/8″ diameter with mounted wheels or burrs



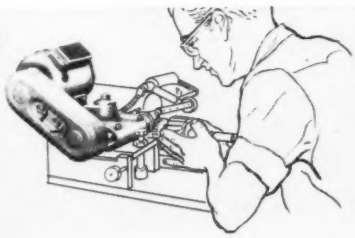
large diameter external grinding
ample power for rapid stock removal; maximum production on big jobs



surface grinding
convert planers, shapers, millers to precision surface grinders



irregular shapes
grind any contour, shape or radii determined by table travel



single purpose grinding
on the bench or in special set-ups

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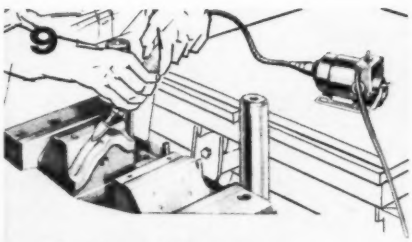

lightweight working convenience
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precision spindles wherever needed
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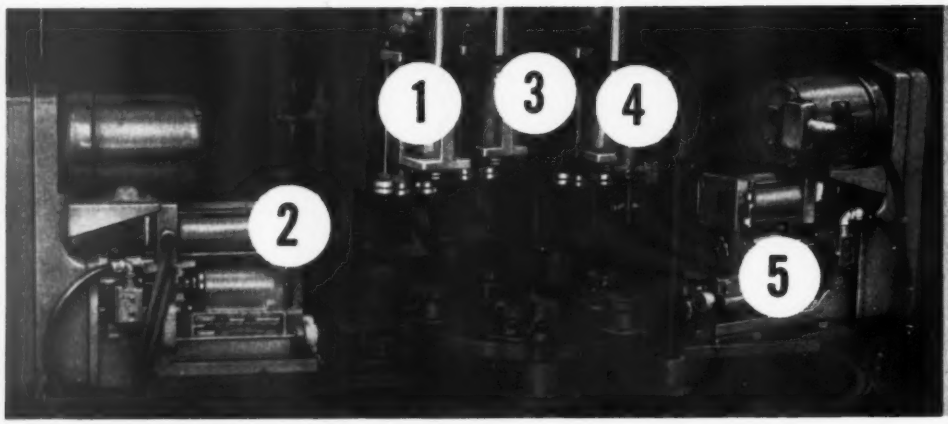
CIRCLE INFORM-A-GRAM KEY NO. 29

The Answer To Important Cost Reductions In 2nd Operation Machining

5 SIMULTANEOUS OPERATIONS



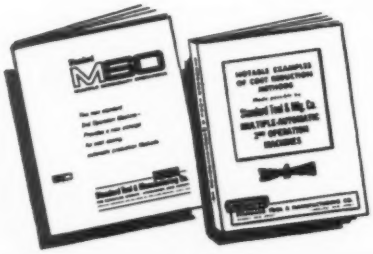
OPERATIONS PERFORMED: 1. Combination drill and counter sink, face to length and chamfer. 2. Cross drill through. 3. Vertical plunge, straddle mill. 4. Tap. 5. Cross mill two slots.

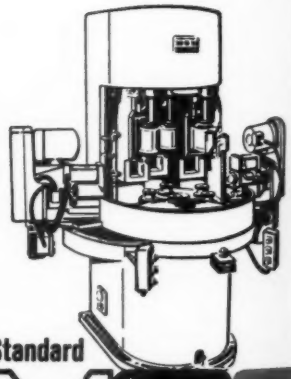
One Representative Exampl From Our Comprehensive Fi of Case Histories.

IF YOU HAVE operations such as those shown above (or countersinking, centering, eccentric turning, milling, deburring, threading, hollow milling), they can be performed simultaneously on Standard MSO — with extreme accuracy and at high speed.

Standard MSO eliminates Hand Screw Machines, Drill Presses, Light Milling Machines, Tapping and Threading Machines, Single Purpose Machines.

These are important savings — To consider possible applications in your situation — send for our new folder #61 giving details of components and complete specifications of MSO — also, our illustrated book of case histories which contains detailed, mechanical drawings. We shall be glad to send these without charge.





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A high speed, versatile machine wh performs many multiple, second ope tions — simultaneously — with gr accuracy. Complete details regard mechanical features and specificatio contained in a new booklet available request. Ask for Booklet, No. 61.

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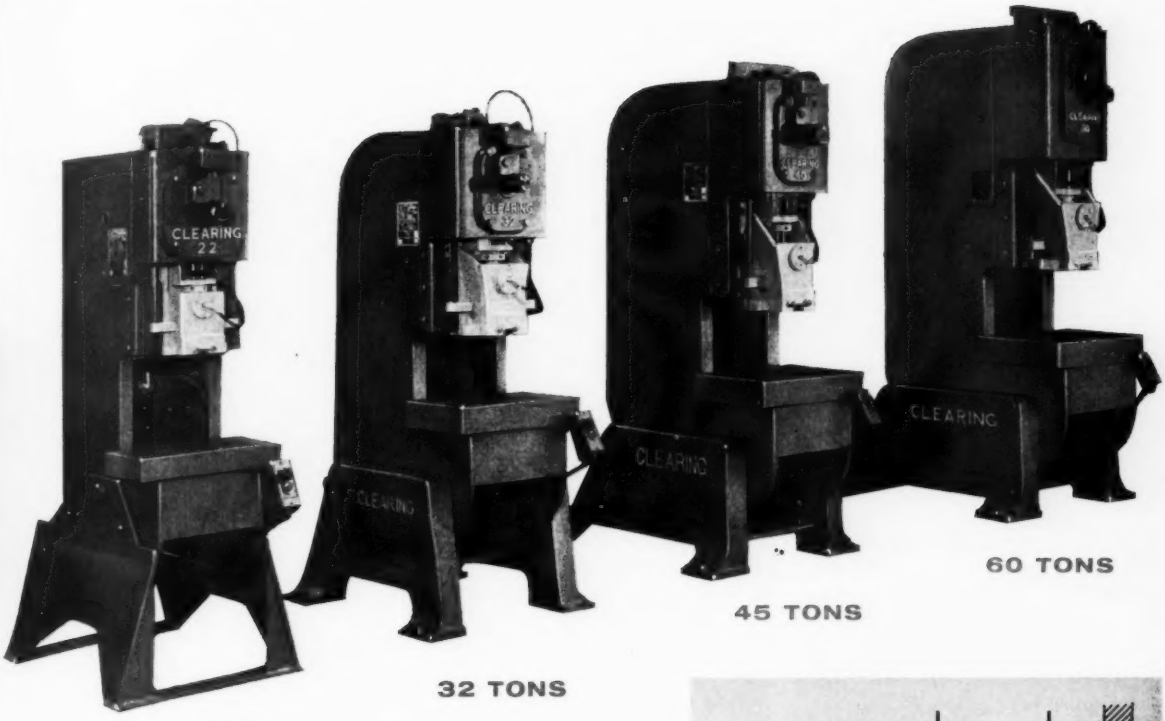
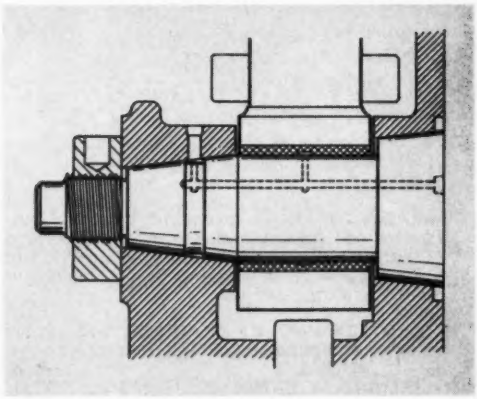


The Clearelease mechanism makes it possible to unstick the press in a matter of minutes. A taper wrist-pin in the press slide provides instant release. Simply loosen locking nut and tap wrist-pin in.



No Fear of Getting Stuck With a Clearing Torc-Pac

"Sticking" a press is a problem that can send a production manager to the nurse for tranquilizers, as you know. And presses **do** get stuck, let's face it. But here's what Clearing has done about it on the new Torc-Pac line of O.B.I.'s. "Clearelease", an ingenious mechanism built into the press slide makes it possible to unstick the press in a matter of minutes. It's simple and fast and the press is back in operation before tempers can rise.

There are a lot of improvements on the new Torc-Pac. A clutch and brake unit that is as quiet as it is maintenance-free is an important plus. Controls are shock mounted. The streamlined design of Torc-Pac conserves floor space. Feeding is easy from any direction. Find out more about the new Torc-Pac. Ask for literature today.

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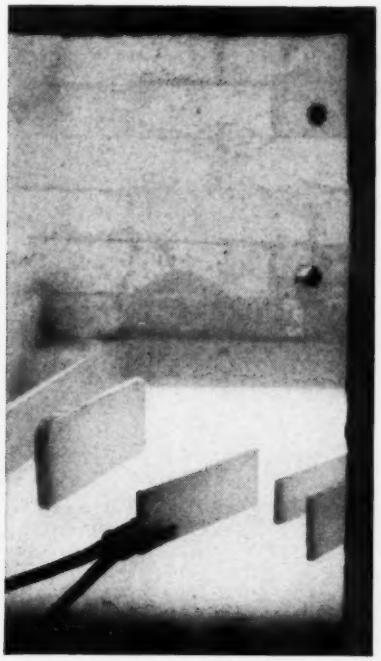
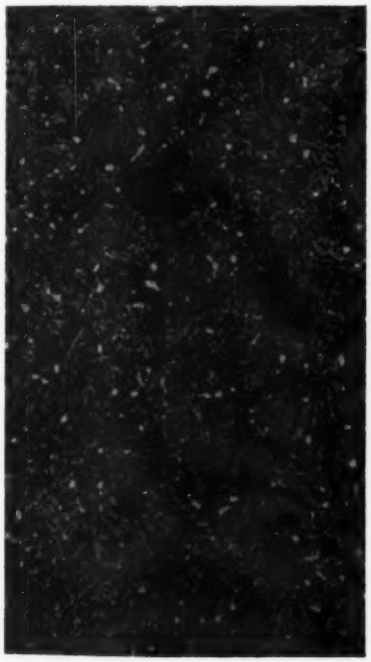


UNIFORM RESPONSE TO HEAT TREATING Each Graph-Mo finished part will have the uniform hardness you want. There's no need for adjustments in heat treating procedure.

30% FASTER MACHINING—Free graphite in its structure makes Graph-Mo machine more easily—30% faster than ordinary tool steels. You save machining time.



OUTWEARS ORDINARY TOOL STEELS 3 TO 1 The free graphite and diamond hard carbides in Graph-Mo's structure work in combination to give longer life to the steel.

PROTECTED BY SPECIAL WRAPPING—Graph-Mo flats are carefully wrapped so that they are delivered in top-notch condition and remain so until you're ready to use them.

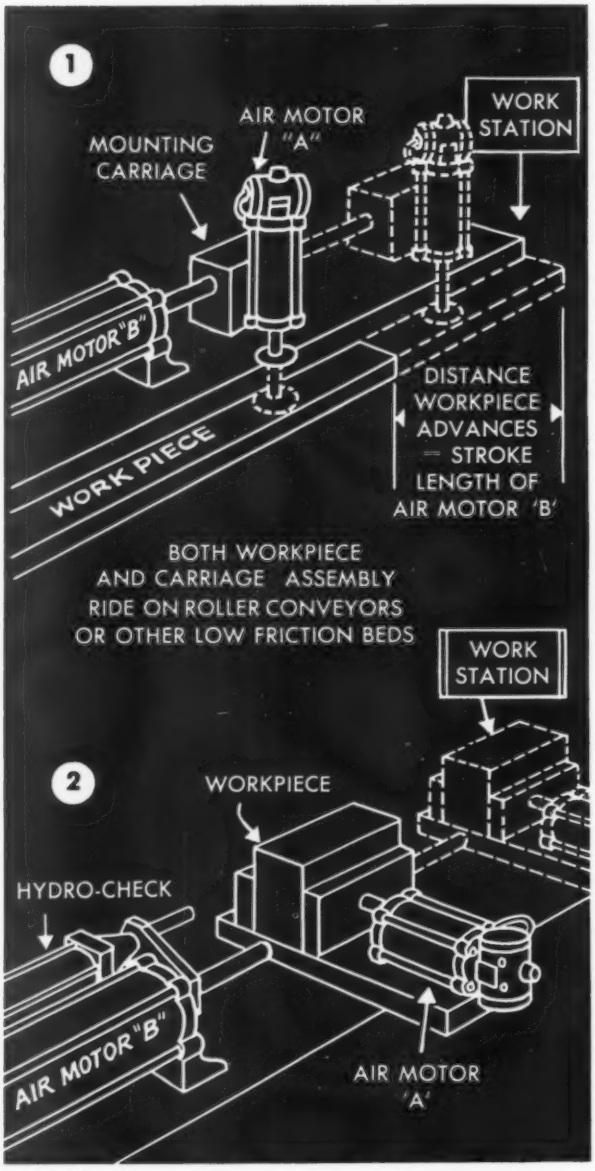
Only Graph-Mo® tool steel combines the advantages of machinability, wearability and stability into one steel. It's one of the family of Timken graphitic steels. And Graph-Mo precision ground flats are available in over 250 standard sizes to give you many opportunities to save. For stock list, call your local Timken steel distributor or write to: The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Makers of Tapered Roller Bearings, Fine Alloy Steel and Removable Rock Bits.

TIMKEN®
FINE ALLOY STEEL

TIMKEN GRAPHITIC STEELS ARE AVAILABLE FROM STEEL SERVICE CENTERS IN 44 CITIES IN THE UNITED STATES AND CANADA

CIRCLE INFORM-A-GRAM KEY NO. 33

TWO IDEAS YOU CAN USE TO FEED AND POSITION WORK AUTOMATICALLY



In most plants today, there are few operations which present greater cost-cutting opportunities than the feeding and positioning of workpieces. Yet often this potential saving remains untapped because the high cost of special workfeeding and positioning equipment may not appear justified.

However, using Bellows Air Motors®, fast, accurate, trouble-free devices to "spot-automate" such operations can be built in your own plant—by your own men—for a fraction of the cost normally involved in such equipment. These two devices are typical:

Fig. 1, at left, shows a set-up used frequently to feed steel bar stock to a cut-off saw, to feed strip metal to a punch press, to position a strip of wood for drilling holes at regular intervals along its length, and in other applications where it is desired to alternately advance a workpiece and pause while an operation is performed. By proper positioning of work stations, it is possible to perform a sequence of operations, such as drill-and-tap, or punch , form-and-stencil.

After the piston rod of Air Motor "A" has advanced to hold the workpiece, the piston rod of Air Motor "B" advances, moving carriage, Air Motor "A" and workpiece a predetermined distance forward. Workfeeder pauses while the operation is performed. Then, Air Motors retract —and the sequence is repeated.

Variations of the extremely simple set-up shown in Fig. 2 are used in virtually every industry. With the piston rod of Bellows Air Motor "A" advanced to clamp the work, Air Motor "B" advances the workpiece to the work station, pauses during the operation, then retracts. Operator unloads, reloads, and the sequence repeats. Incorporation of a Bellows Hydro-Check® provides a perfectly controlled, highly accurate feed rate, permitting this set-up's use with routers, drills, milling machines and similar equipment.

* * * *

In addition to The Bellows Air Motor, used as the "heart" of work feeding and positioning devices designed and built by creative production management everywhere, Bellows-Valvair also produces a line of Rotary and Linear Feed Tables, as well as a series of Rotary Index Tables—all completely integrated pneumatic "packaged" units including all controls and built-in wiring.

851-C

INTERESTED IN CUTTING WORKFEEDING COSTS?

If so, you'll want the special "package" we've made up. It includes a "Spot-A-Mation Idea" File, containing information on a number of different workfeeders, as well as complete information enabling you to "spot-automate" scores of other operations. In addition, we've included specs on our Rotary Feed and Index Tables and Shuttle Work Feeders. For yours—without cost or obligation—address: Dept. TP-1261, Bellows-Valvair, Akron 9, Ohio.

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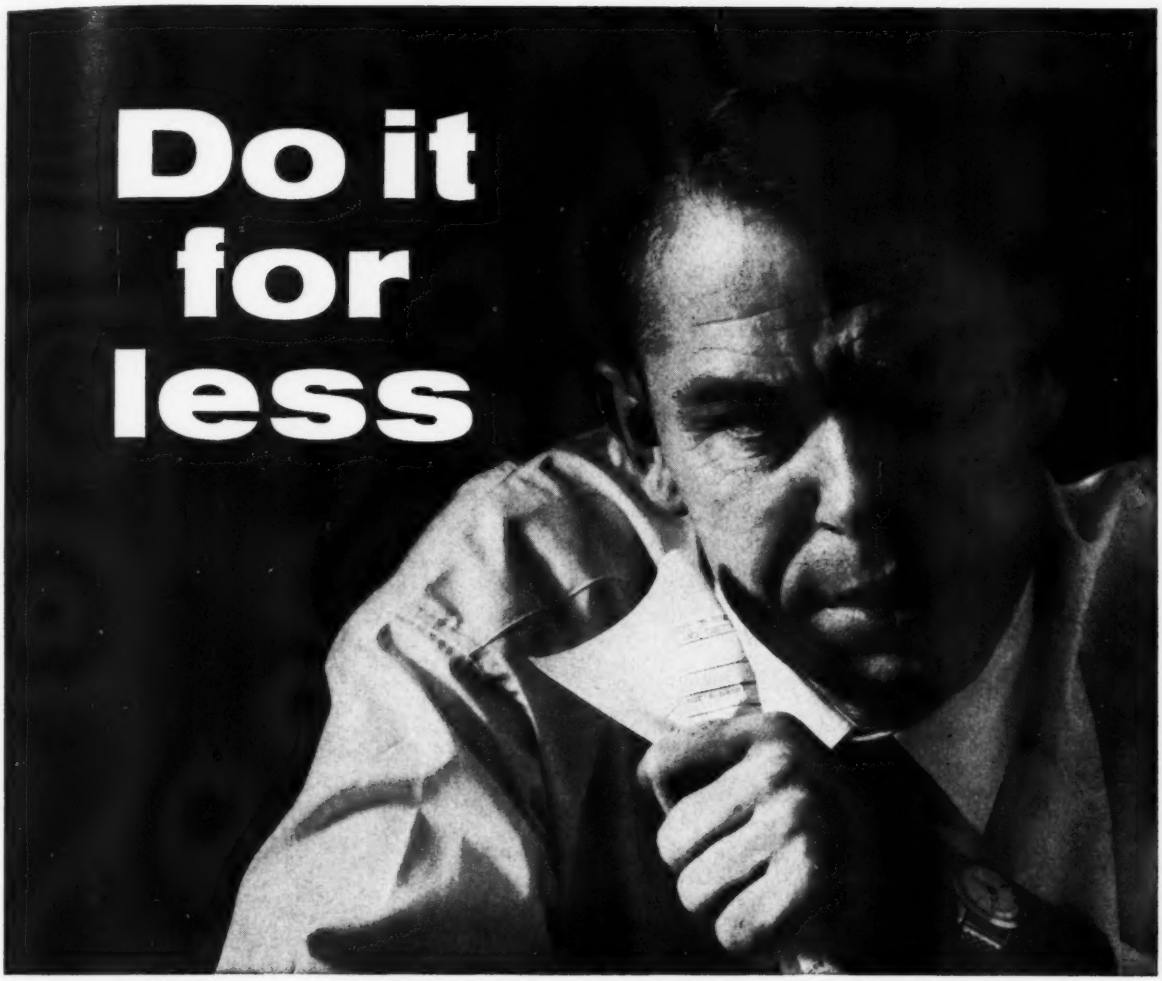
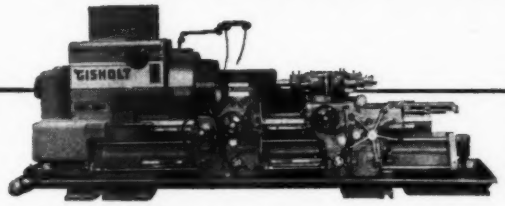


ON A GISHOLT SADDLE TYPE TURRET LATHE



Gisholt MASTERLINE 3L
Saddle Type Turret Lathe

Offers Maximum Operator Ease.
Speed selector for 12 or 24 spindle speeds.
Separate lever controls for cross and longitudinal rapid traverse.
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JETracer (for cross slide, cross-feeding hex turret, or mounted on turret face) handles tapers, contours, steps and combination forms automatically.

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This man has just lost an order because his turret lathes couldn't compete. Yet, they are *only* ten years old . . . as are over 65% of the machines in use today.

With all the talk about tape control, it's easy to forget that even the standard turret lathe has changed. It's 40% more efficient than it was ten years ago. Many skilled manual operations can now be done automatically. *You* could rely on *fewer* machines and save time, floor space, reduce tooling and maintenance costs, and skilled labor requirements!

If you have ten-year-old's in your shop, it's time to act. Find out what the new Gisholt Turret Lathes can do for you.

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Over 40 sizes...with all popular tapers... in four styles...to choose from. That's how Ideal helps you meet your turning needs for the heaviest work to the lightest of light jobs.

Ideal Live Centers are guaranteed to provide the highest accuracy required, exactly matching the lathe size you use. What's more, they are custom quality designed and manufactured by production methods to give you the lowest possible precision center point costs.

You can get Ideal Live Centers from your distributor's stocks. He'll give you *immediate delivery service*—which reduces your inventory requirements and cuts your investment costs. If you need a special, we'll be glad to work with him to meet your specifications at the *right* price.

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CIRCLE INFORM-A-GRAM KEY NO. 36

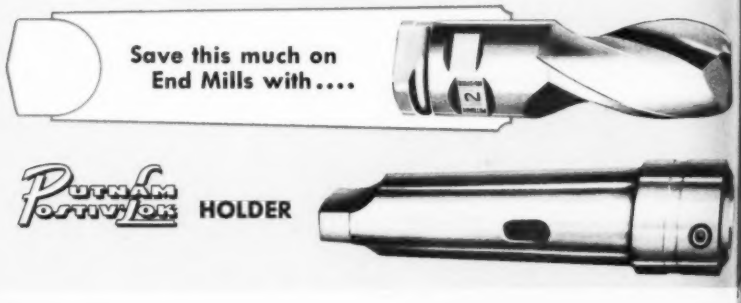
BIG SAVINGS IN
LARGE CUTS

CUT YOUR COSTS OVER 25% ON END MILLS 1½" DIAMETER AND LARGER WITH

The Putnam Postiv-Lok design for large end mills eliminates the need for and expense of long tapered shanks. Instead, the Postiv-Lok concept of end mill tooling puts the heavy shank on a holder that quickly pays for itself through savings realized in the purchase of Postiv-Lok end mills.

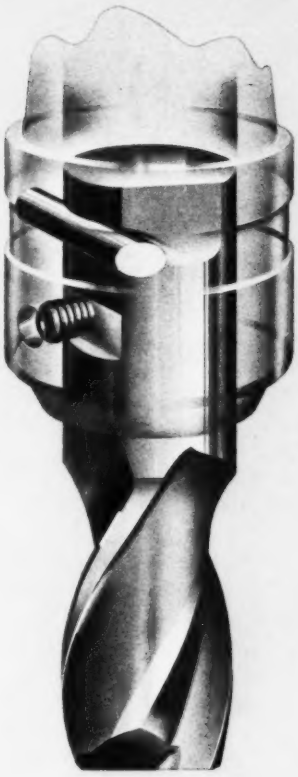
Also, the use of Postiv-Lok end mills and holders eliminates the costly breakage that is possible with welded shank end mills. Postiv-Lok end mills are milled from solid steel—there are no welds that might break and separate the shank from the fluted portion. Thus, Postiv-Lok eliminates a cause of costly shut-downs and replacements.

Another cost saving is realized with Postiv-Lok during tooling change-over. Being much lighter, Postiv-Lok end mills are easier to handle than large tapered shank end mills—easier to insert and remove. And, when the next operation requires a different style or size of end mill, or even drilling and reaming, Postiv-Lok adapters permit quick change-over from one tool to another without changing the holder in the spindle.



PUTNAM PRECISION TOOL

PUTNAM POSTIV-LOK



Postiv-Lok is a proven locking mechanism for large end mills. It has saved time and costs for countless users throughout the country. Try it on your most rugged milling application. Postiv-Lok is available from stock on end mills ranging from 1½" to 3" in diameter. Also, it can be furnished in special sizes and designs to your specifications.

Here is how Postiv-Lok assures positive locking of end mills in the holder (see phantom drawing for lock construction). Simply insert the end mill in the holder so the top flat is positioned to pass the locking pin; give the end mill a quarter turn to the right and it is securely locked in the holder. Tightening of holder set screw prevents end mill backlash. The end mill cannot vibrate loose or pull out of the holder. In fact, the locking action is aided by the torque of the end mill in operation.

When put to work on big jobs, the fast, free-cutting action of Postiv-Lok end mills really save time and costs. Also, their exceptional durability assures long life even when operated at high speeds and heavy feeds. Try them on your toughest jobs—they will get them done faster and at lower cost.

CUT FASTER — LAST LONGER

Over 1800 Standard Types & Sizes of Putnam End Mills

Now you can order standard end mills ranging in diameter from 1/32″ to 6″ and get off-the-shelf delivery. In the Putnam line of over 1800 standard types and sizes, are many end mills that are considered as "specials" by other manufacturers.

Regardless of your requirements, there probably is a Putnam standard end mill that will exactly meet your needs. Thus, you can obtain quicker delivery, plus all the superior Putn cutting qualities, and at lower co than "specials".

You will save time, money and space by using the services of your local Putnam Distributor

- He has large stocks that are immediately available.
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- Using his services assures savings i your stockroom space requirements.
- His stocking of products means yo have less money tied up in inventor

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TOOLING & PRODUCTION
The Magazine of Metal Working Methods

How's Your Information Lag?

THE BUSINESS PROBLEM curve has a steep ascent compared to the curve representing answers. The problem comes before the answer, but the greater the management lag, represented by the difference in ascent of the two curves, the greater the aggravation.

To solve problems quicker and **more efficiently** we need a continued step-up in methods of obtaining information. Do you have a system setup to pull in from all sources the information you need to solve your problems? You can't leave it to your competent subordinates in all cases. Perhaps their experience doesn't equip them with the systematic information gathering faculty. And even if they get the information they need, it may be too late. By then, there's another "pile" they should be using or considering.

Statistics tell us there are 60 million pages of technical writing each year. True, some is not worth the paper and much is not for you, but this still leaves maybe a million or more pages that you should have perused. How to do it?

One of your people could make a study of publications catering to your needs, including textbooks on the subject. Get on everyone's mailing list, (if you are not already) but don't be afraid to order even the doubtful publications. The cost is slight compared to possible gain.

However, being on all lists is not enough. You should set up a system to handle ordering texts, new magazines, etc. If you can't afford a fulltime librarian, give the duty to a competent person to make preliminary decisions on what you should have in your plant. This person should be equipped with a list of all department heads, with details of their current and future (if possible) workplans. Sure, as a competent company hand he will know what's going on and who should receive what, but with a checklist it's so much more positive—and effective.

If you have a fulltime or part-time librarian, he should clip magazines after they are circulated, and keep an extensive "morgue" for reference. You say this is fine if your people will use it? Charge them to use it. Make it worth using, then demand reference to it on each new job proposal.

You say there's too much to read now. This is another reason you have to do it systematically. And have competent people screen it. Magazines, like newspapers, are always looking for a scoop—and often get it. Magazine articles in most instances expose you to current practice, or give you information on equipment or methods that will be used in the future, when users are able to shift their activities to adopt them. So don't sell any published information short. For those already practicing a method just being described in an article, there are thousands still doing it the old way.

Of course the best way to handle new technical information is to establish a manufacturing research department. Even one fulltime person can take care of all published information and do development work too. But he has to be good. If you choose him carefully, his salary will be worth it.

A manufacturing research man on your payroll may not seem like a must today, but will be tomorrow. Why wait till tomorrow?

William E. Hoffman
Editor

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Drilling Tool Specifications

Speed Range	900-22,000 rpm
Capacity	1/16" through 3/16"
Weight	5 1/16 through 5 3/4 lbs.
Length, Overall	16 11/16" through 21 1/4"

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CIRCLE INFORM-A-GRAM KEY NO. 42

TOOLING & PRODUCTION

The Magazine of Metal Working Methods

VOL. 27, No. 9
DECEMBER 1961

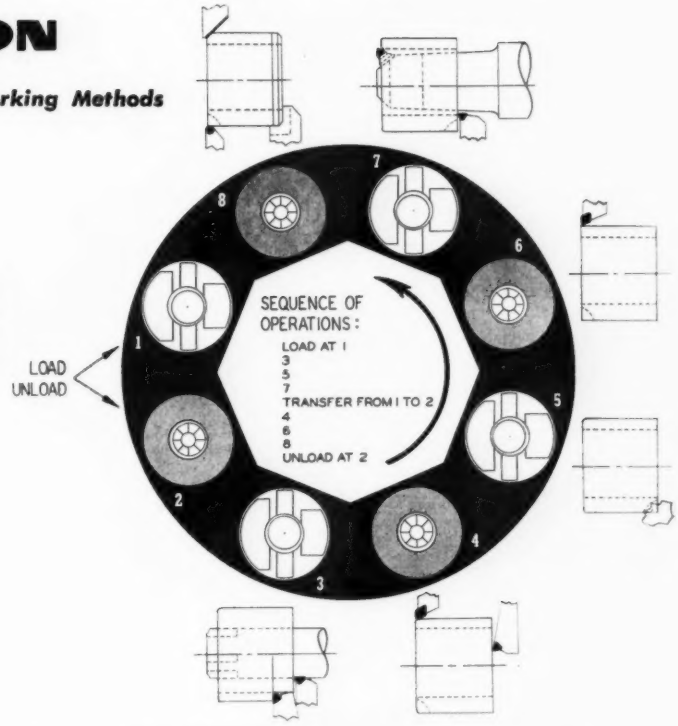


Fig. 1 Head-on view of chucker's drum, with machining operations associated with stations at which they're done. Eccentric workpiece is apparent. Spindle positioning is employed at stations 1, 2 and 5.

Chucker Tooling Eliminates Secondary Operations and Operator Fatigue

by S. A. Cappon

Mr. Cappon is manager of the Production Methods Div., National Acme Co., Cleveland, O.

ONE MACHINE HAS BEEN TOOLED to do work that formerly required two in machining an eccentric pearlitic malleable casting.

While automatic loading and spindle positioning on a chucking machine aren't new, this case posed some peculiar problems for engineers at National Acme Co., Cleveland. They had to develop an efficient automatic setup that would permit magazine loading, spindle loading, extraction, part turnover, reloading and discharge of the irregularly shaped part into a chute.

Their solution has eliminated manual handling and secondary operations, boosting operator productivity 100% while increasing net production 8% on this chucker.

The part was originally produced on a double-indexing Acme-Gridley 6", 8-spindle chucking machine. The first four spindle positions were used to machine the ID and face one end. The locating slot, a design feature that maintains the required eccentric relationship between ID and OD, had to be milled on another machine, and the part returned to the chucker to turn the OD and face the opposite end.

Manual transfer from one machine to another caused delays. It combined with operator fatigue to slow production considerably.

Excessive handling included loading, unloading and positioning for both first and second operations during the chucker's 20-sec cycle. Operator fatigue lowered production, and the addition of a second operator to ease fatigue hiked the cost per piece.

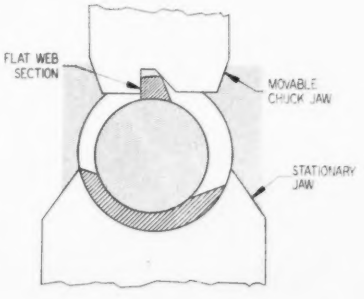


Fig. 2 Critical chucking arrangement for first operation work. Movable jaw must be positively loaded against the flat web of workpiece.

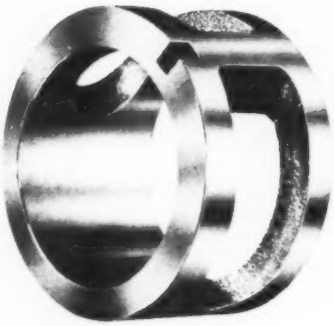


Fig. 3 The finished part.

Slot Milling Simplified

The first step in reducing handling was to find a way to mill the slot during the machine's first four-station sequence. This was accomplished on a similar double-indexing National Acme 6" RPA 8-spindle chucker equipped with spindle positioning mechanisms. Quick change carbide cutters are used for all machining except slot milling, for which an HSS milling cutter is used. Spindle positioning was applied to three stations — those for loading, unloading and slot milling (Fig. 1, Stations 1, 2 and 5).

Positive and accurate spindle positioning is required to mill the slot in an absolutely set position relative to the part's eccentricity. When the spindle is stopped, it is disengaged from the main drive and immediately released to permit the positioning mechanism to operate. After the spindle is positively locked in a pre-determined position, slot milling is completed and the chucker indexes to the next position.

Spindle positioning mechanisms are hydraulically operated, and all braking and releasing actions are initiated through a series of limit switches, relays and solenoids. The arrangement includes "fail-safe" features, which automatically stop the machine in the event of malfunction. For example, the machine would stop if part was improperly chucked, or the slot was not keyed properly on the mandrel.

Handling Problem Attacked

After secondary operations were eliminated, there still remained the problem of operator fatigue caused by excessive handling during the fast machine cycle. Chucking for the first operation sequence (Fig. 1, stations 1, 3, 5 and 7) is accomplished with two eccentric jaws, one stationary and one movable (Fig. 2). The operator formerly had to insert the casting into the chuck so that the movable jaw was positively loaded against the flat section of the web. Here spindle positioning facilitated the former hand loading operation, and was essential for proper orientation in automatic loading of the eccentric part.

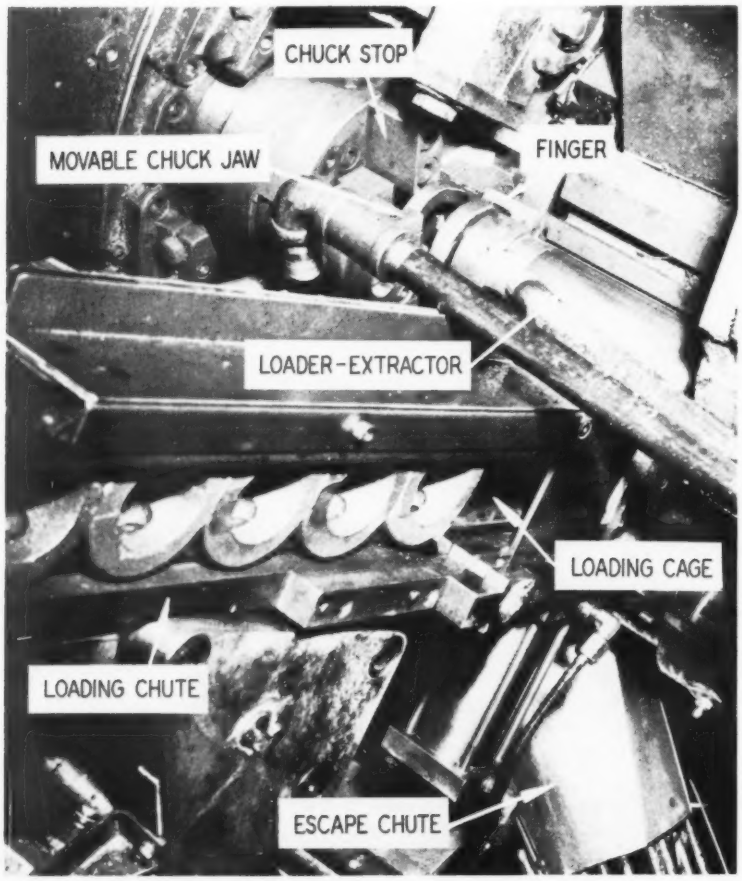


Fig. 4 Trap allows one part to enter loading cage after machine indexes. Air cylinder beneath cage raises part in line with loader-extractor, where fingers grip part and place it in chuck. With spindle positioned, movable chuck jaw wraps around bridge of part, holding it against chuck stop until jaws close automatically. Fingers release, retract, and the machine indexes.

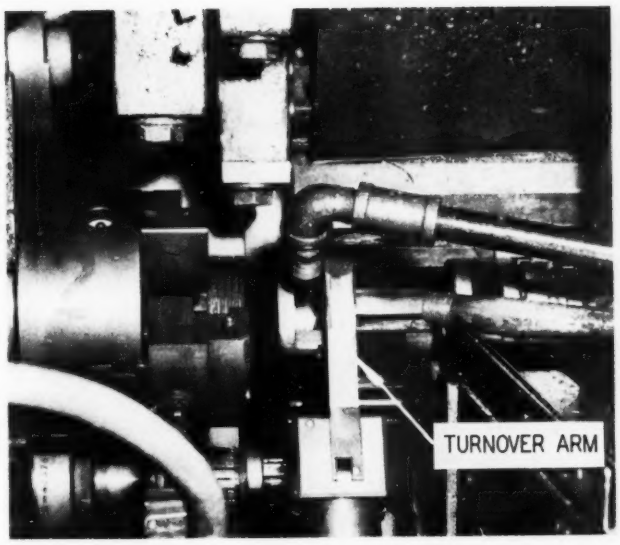


Fig. 5 Fingers of turnover arm remove the part from the chuck at the beginning of transfer from first to second operation sequence.

Second operation work (stations 2, 4, 6 and 8) requires the part to be turned over and placed over the expanding mandrel so that the milled slot is located on a key at the mandrel's base.

National Acme engineers applied an automatic turnover arm, and another loader and extractor, to service the loading station (station 2) for second machining.

After first operation machining, the machine indexes back to station 1 where the turnover arm, with its two thin jaws, removes the part from the chuck (Fig. 5). The arm lowers the part in front of station 2, flips it 180°, and aids the loader-extractor in locating the part properly on the expanding mandrel. Both the turnover arm and the loader-extractor then release the part and retract, and the chucker indexes through the second operation sequence.

When this sequence ends, the finished part is indexed back to station 2, where the loader-extractor strips it from the mandrel and drops it into the chute. The entire eight-station cycle for one part requires about 20 sec. ■

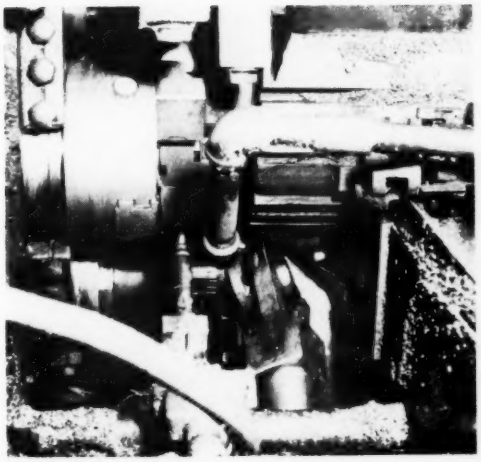


Fig. 6 The Turnover arm has dropped in front of station 2, and it has begun 180° rotation of part.

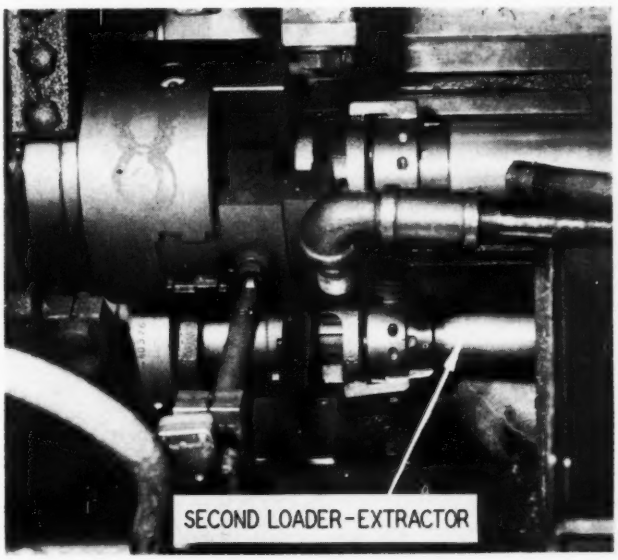


Fig. 7 Turnover arm and second loader-extractor place the part over the mandrel. First operation loader-extractor services station 1.

Fig. 1 Paul Hamisch, chief engineer, and Joe Kunka, tool engineer, are shown discussing their setup for milling cams on a basic milling machine.

Need Cams?

— adapt a machine

THE MONARCH MARKING SYSTEM COMPANY, DAYTON, Ohio has increased cam production 100% with this simple adaption.

Before adapting this setup they made similar cams the hard way — on hand-operated machines. Their cost was considerably higher and production was low.

Knowing they couldn't compete long using their old method, they set about to find a better one. Paul Hamisch and Joe Kunka, shown here, came up with the idea described and illustrated. They used an M&M Roto-Mill table on a Kent-Owens miller, and were able to double production.

With the rather inexpensive change they were in the business of making cams semi-automatically. All that was necessary was a simple bracket attached to the over-arm to support the cam follower. The master cam is mounted on the face plate of the power table, which is used in a vertical position. A weight was hung on the table movement hand lever to hold the follower against the master cam.

The M&M Tool & Mfg. Co., Inc., Dayton, Ohio also supplies the Roto Power unit that turns the milling table. ■

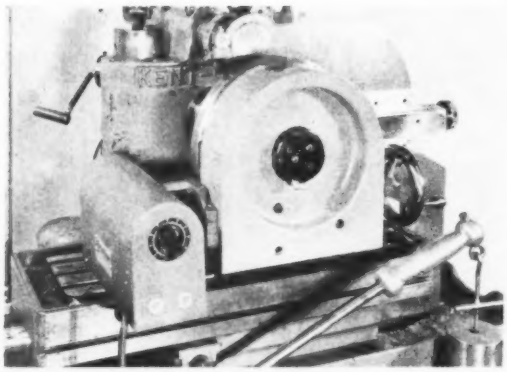


Fig. 2 Milling machine table adaption to make cams semi-automatically.

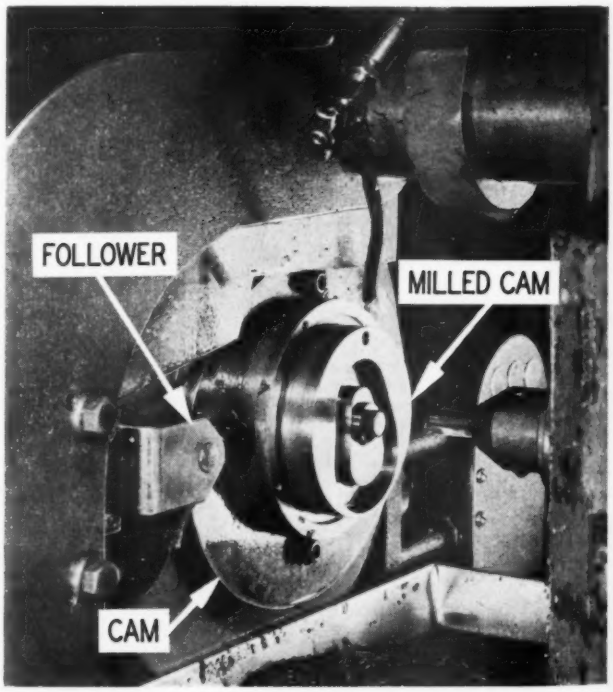


Fig. 3 Closeup after cam has been cut. Being large, the shape of the master cam is deceiving.

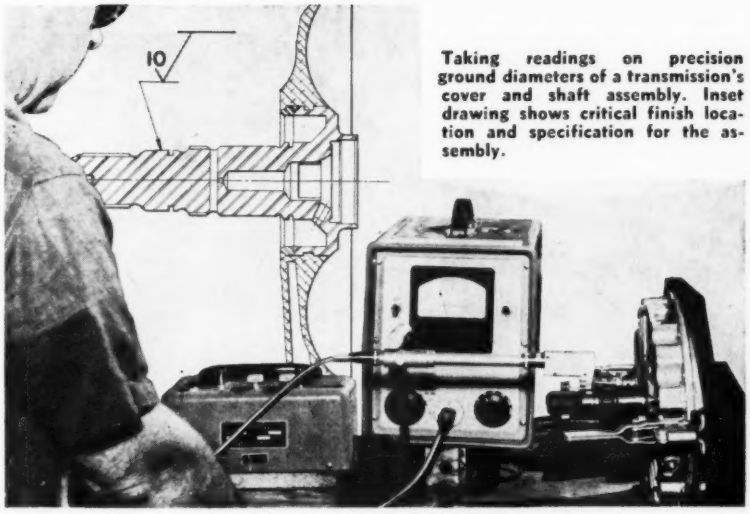
Surface Finish Is Key to Reliability

YEARS OF EXPERIENCE in producing automotive parts have shown one prominent transmission manufacturer that component malfunction can often be traced to rough surface finishes.

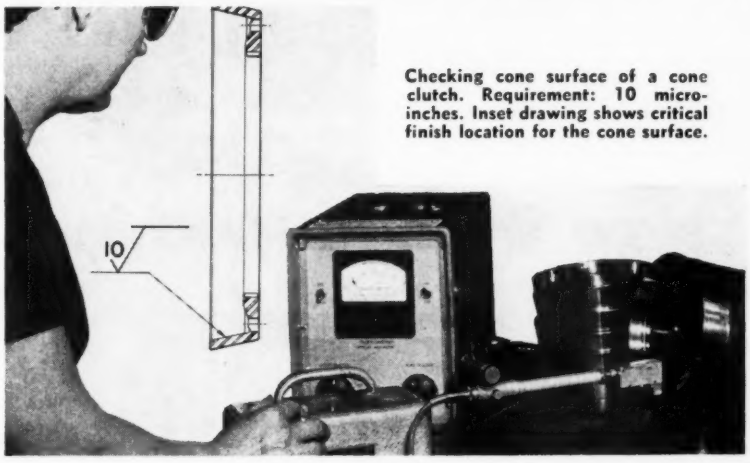
Engineers at this facility have compiled extensive data on the relationship between a microinch finish on important parts and the functioning of these parts in the completed assembly. Their quest for a low microinch reading has led to the installation of precision measuring equipment **at the production line,** and no part leaves production until it passes testing.

Readings from Profilometers manufactured by Micrometrical Mfg. Co., Ann Arbor, Mich., taken at frequent intervals on a variety of critical surfaces, help alert inspectors to unsatisfactory cutting tool performance. These early warning signals point to the need for sharpening or replacing dull tools, and help maintain consistent quality of the finished product.

Precision ground diameters on the shaft of a cover assembly are held to 10 microinches through regular readings. The cone surface of another key part with a 10-microinch specified finish comes under the sensitive probe of the Profilometer as it passes along the production line to assembly.



Taking readings on precision ground diameters of a transmission's cover and shaft assembly. Inset drawing shows critical finish location and specification for the assembly.



Checking cone surface of a cone clutch. Requirement: 10 microinches. Inset drawing shows critical finish location for the cone surface.

In addition to these production units located at strategic inspection stations throughout their plant, a complete complement of Profilometer equipment works in the central inspection laboratory of this transmission manufacturing concern. Inform-A-Gram No. E1.

Industrialist Honored

Louis F. Polk, board chairman of the Sheffield Corp. and vice president of the Bendix Corp., has received the American Standards Assn.'s Howard Coonley gold medal and citation for 1961.

He was honored for his "outstanding service to the advancement of standardization."

Mr. Polk, author of a number of technical books, is a past president of both the National Machine Tool Builders' Assn. and the American Ordnance Assn.

He has been active in the advancement of standardization since 1934. He has worked for American Standards since 1941. Since 1945 he has been a U.S. policy correspondent on the American-British-Canadian Engineering Unification Conference. In 1960 he was a U.S. delegate to the 11th General Conference on Weights and Measures. The group adapted a wave length of light as a new standard or reference for linear measurement.

At Sheffield, Mr. Polk was instrumental in instituting the Eli Whitney Metrology Laboratory in 1956. It provides industry with equipment and manpower for certification of precision standards to light-wave accuracy.

The Tape-O-Matic at work.

New Drilling Machine Broadens NC Attainability

THE RECENT INTRODUCTION of a new drilling machine represents a bold stride toward making the advantages of numerical control attainable for any shop that can put NC to work profitably in its drilling operations.

The most significant thing about Pratt & Whitney's Tape-O-Matic drilling machine, according to officials of the West Hartford, Conn., firm, is that they can sell the basic machine/control combination for $8595. They can do this because they have designed the machine to be produced in greater numbers than is traditional.

Daniel C. McCarthy, P&W's executive vice president, says, "We know that very few companies will be able to exist without it (NC) in the next decade," and that "every metalworking shop can use numerical control advantageously today." He continues that the Tape-O-Matic developed from a desire to enable every shop to "get its feet wet" in NC.

Tape-O-Matic's machine director accepts standard 1" wide, 8-channel paper or mylar tape. The program for this point-to-point machine tool is set up by the solid state IBM 1401 data processing system, and was developed jointly by Pratt & Whitney and IBM.

Simple Programming

To program the machine, a process man begins by reading the engineering part drawing, and lists the dimension of each hole from a zero position he has chosen. He also determines the simplest and most time-saving location for a setup point, which will be used by the machine operator to locate the workpiece on the machine table. The dimensions from zero to the setup point become the first entry on the process sheet.

The process man next establishes the most economical sequence of operations to do the job —drilling, tapping, countersinking —and lists the proper dimensions to each position in that sequence. He completes his job by making a simple sketch of the setup for the operator, and listing the required tools and any other specific requirements needed for 1401 programming, from which a typist punches the tape.

Economies Interpreted

Users of numerically controlled machine tools have found that they reap economies in leadtime from blueprint to production, and also realize savings by eliminating much of the special tooling inherent in short run production. This new P & W machine offers these economies in addition to its "more than competitive" price tag.

For example, preparing the tape for one of P&W's own machine tool parts being processed on the Tape-O-Matic—a part that requires 51 holes to be spotted and drilled with three tool changes—required just two hours of the process man's time, and another hour to punch the tape. This represents an approximate tape preparation cost of $15. P&W officials say that a conventional drill jig for this job would cost $500, and require three weeks leadtime to design and manufacture.

The standard machine/control combination allows tape controlled positioning of the two-axis table within a location tolerance of 0.0003, and provides manual drill feed. It can be equipped with an attachment that allows the drill to be fed automatically.

P&W offers a money back guarantee if the machine doesn't reduce the drilling costs of any company within 90 days. They also offer a 5-yr warranty against defective parts and workmanship, which they describe as a "first" for a numerically controlled machine tool. ■

From the Cover:

A Jewel of the Machine Tool Industry

LIKE JEWELS in a fine watch, precision machines require their counterpart. The precision lead screw shown on the cloth is seldom seen out of its natural habitat. That habitat might be in a Moore jig borer, jig grinder or the Moore universal measuring machine.

This "screw" is for movement within 18″ in which the error is no more than ±12½ millionths.

With present machine tool sophistication, it is easy to lose sight of the fact that homage is still due the hands of man. Certain ultra precise work, such as the lapping done on this lead screw, may always necessitate the use of hands. And hands are still needed to use the precision gaging equipment surrounding the lead screw.

Further on the handwork involved here:

The 18″ step gage has been hand lapped to within ± 2 millionths.

The 26″ edge is lapped straight and parallel to within 5 millionths.

The Master tee square has been lapped to a sensitivity of 5 millionths within the 18″ of its longest leg.

The 24″ cylinder square is lapped to detect errors within 10 millionths/ft.

And the 42″ square Moore master plate is hand lapped flat within 20 millionths.

These gaging pieces, (in reality the lead screw is a built-in master gage) are all made of Nitralloy, known for its hardness and stability. They are built to their extreme accuracy to help produce the geometry necessary to support the performance of the lead screw. The last operation in their manufacture is hand lapping. ■

Two to Study Israeli Metalworking

Two officials of Metcut Research Associates Inc., Cincinnati, Ohio, have been named by the International Cooperation Administration, U.S. Operations Mission to Israel, to provide technical assistance for the metals industry in Israel through May 1962.

They are Norman Zlatin, a founder and vice president of Metcut, and Dr. John F. Kahles, a vice president who assisted in organizing Metcut and was formerly professor of metallurgy at the University of Cincinnati.

The appointments grew out of recognition of the need for technical assistance in establishing a "technical field service in the metals industry."

In 1957 the Israel Ministry of Commerce & Industry and the Israel Institute of Technology established the Israel Institute of Metals. The Institute has active U.S. Operations Mission support.

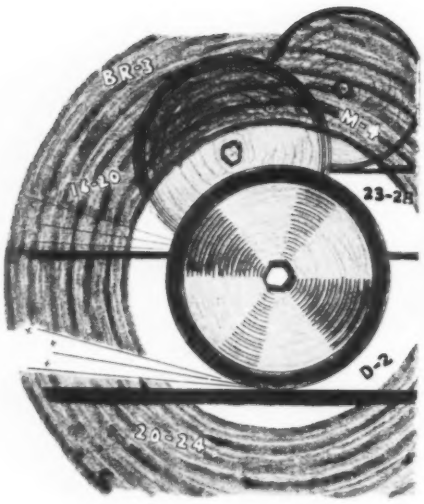
Only a small number of the near 2000 Israeli industries have used the Institute's services. The means formerly used to attract them—symposia, lectures, quarterly publications, press notices—have not been completely effective.

Many small enterprises, often with limited technical facilities, and not always with proper understanding of technical goals, have needed a more direct approach. This new approach will be the Institute's visiting technical service or Technical Field Service.

Mr. Zlatin, as the Institute's mechanical engineer, has broad experience in modern metal cutting and forming operations, and in metalworking research. He will visit metalworking plants in Israel to advise on current and long-range mechanical problems and assist the staff of the Institute of Metals in selecting and setting up facilities and procedures to conduct this research.

Dr. Kahles, as the Institute's Metallurgical engineer, will assist in solving metallurgical problems dealing with selection of materials, metal casting, heat treatment, and forming of metals. He will initiate and supervise applied research projects in metallurgy.

He is the 1961 holder of the W. H. Eisenman Memorial Award (Cincinnati Chapter) of the American Society for Metals.



Grinding Research Report

Don't Veto Diamonds

Just Because of Wheel Cost

FIFTY PERCENT SAVINGS in total cost . . . stock removal up to 60% faster . . . greater ease of holding dimensional precision — these are some of the benefits resulting from using man-made diamond wheels to grind the more resistant, high vanadium, high speed and die steels.

In the softer tool steels, there is a gain in ease of holding dimensional accuracy and/or flatness that may favor the use of the slow wearing diamond wheel, even though stock removal cost per cubic inch is equivalent or higher.

Extreme difficulty in grinding to required tolerances at reasonable rates with conventional wheels has been one of the deterrents to use of higher vanadium tool steels (over 3% vanadium).

Wheel wear with conventional abrasives is so great that it is difficult to achieve flatness in surfacing operations, or consistency of dimension in cylindrical pieces. The vanadium carbide in these steels provides superior wear resistance, but creates grinding problems, since it is nearly as hard as aluminum oxide.

For diamond wheels to be considered to grind high-vanadium tool steels, the total cost of finishing a piece must be competitive with that for conventional aluminum oxide wheels. But how could this possibly be with the wheel cost ratio approximating 150 to 1?

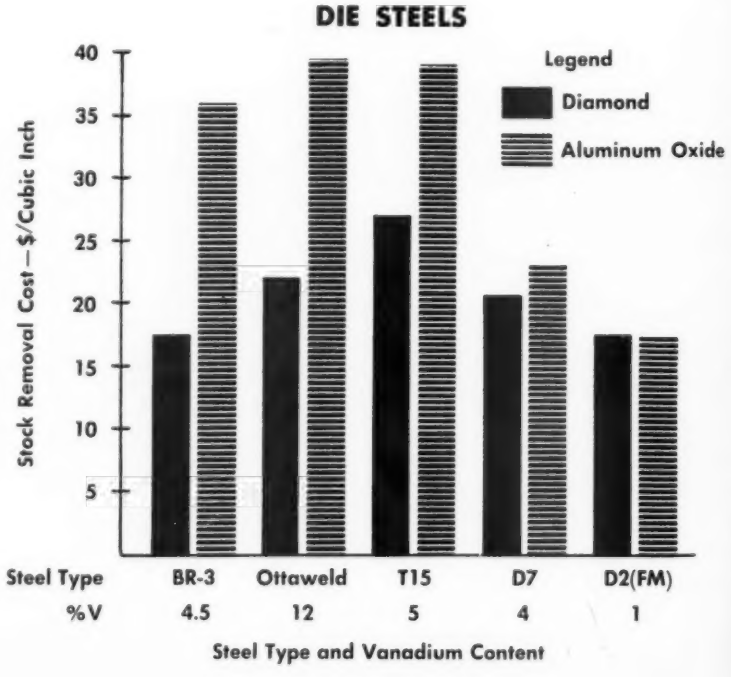
The following results, while obtained in the laboratory of Metallurgical Products Dept., General Electric Co., have been field-confirmed in an increasing number of jobs, and indicate that, considering tool costs (wheel, labor and overhead), diamond wheels may give substantial savings.

A number of high-vanadium steels were tested, as well as several low-vanadium, relatively easy-to-grind steels.

Experimental Conditions

Eleven steels were evaluated during the investigation, six of which appear to be promising for diamond wheel applications. A comparison was made between a 100-grit vitrified diamond wheel with man-made diamonds, 7″ dia, ½″ wide; and 60-grit semi-friable aluminum oxide wheels, 8″ dia, ½″ wide.

The 60-grit aluminum oxide wheel used for comparison is one



of the most popular for stock removal operations on steels of this type. The 6″ long, 1″ wide test block was surfaced longitudinally on a 6 x 18″ horizontal spindle surface grinder. A 1:100 emulsion of soluble oil in water was used as grinding fluid.

Wheel speed was 6000 sfpm; table speed, 60 fpm; unit downfeed, 0.001 per completed crossfeed; and crossfeed, 0.050 per pass.

After the man-made diamond wheels were trued with a brake-controlled device, they were conditioned by preliminary grinding in which total downfeed was 0.010. Test runs involved a total downfeed of 0.100 for diamond wheels, and 0.020 to 0.030 for the aluminum oxide wheels, depending upon wear rate. Aluminum oxide wheels were trued with diamond.

Wheel wear and stock removal were measured with a micrometer after each test.

Major Costs Established

The cost comparisons were limited to labor and wheel costs, since these constitute the major cost factors. Minor costs such as those for wheel changes, power, and dressing were not calculated because of their negligible effect on the total cost.

The cost figures used for the comparisons were: man-made diamond wheel—$568; aluminum oxide wheel—$3.43; labor plus overhead—$10.00/hr.

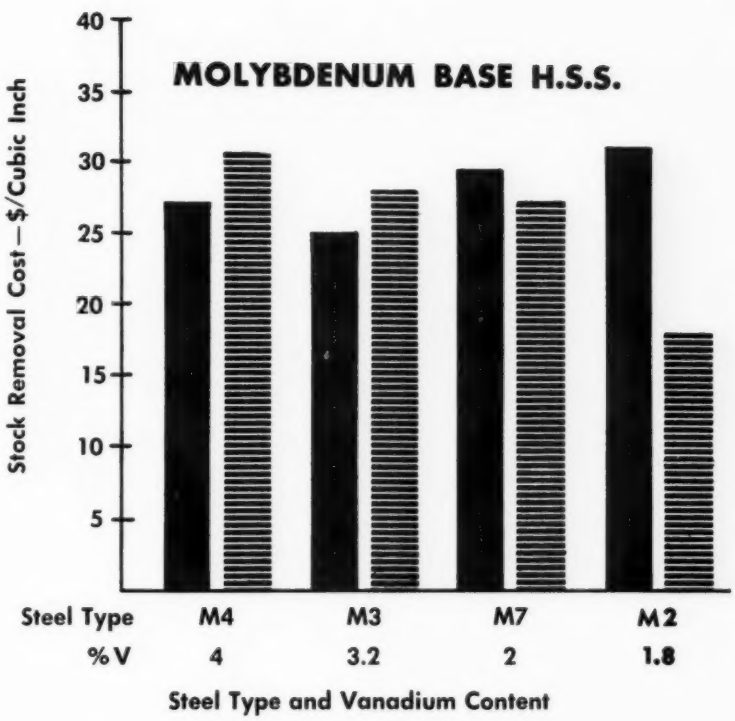
Total cost to remove 1 cu in of steel = wheel cost/cu in + labor cost/cu in.

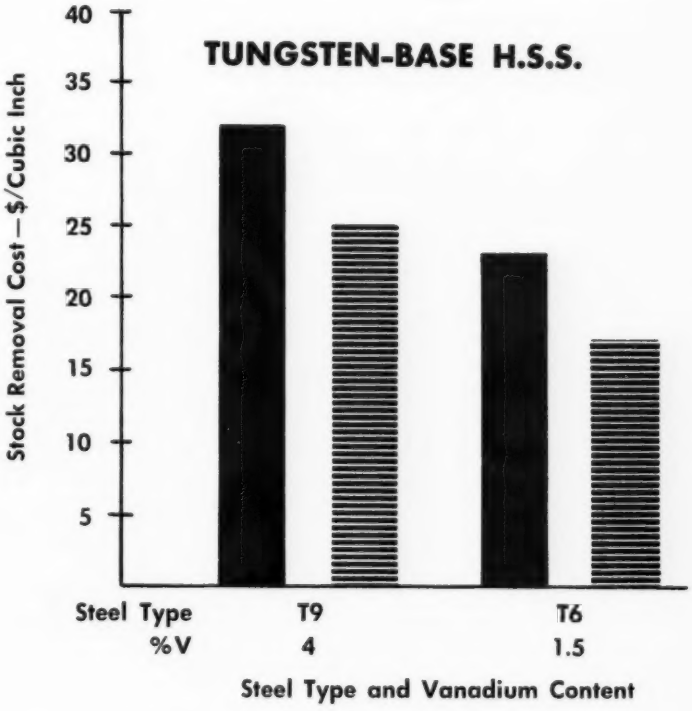
In addition to total cost per cubic inch of steel, the following additional evaluation factors were compared: grinding ratio, rate of cut, wheel wear per 0.100 downfeed, estimated life of wheels in cubic inches of steel, surface finish comparison, effect of larger grinding area, effect of diamond wheel grit size.

Test Results

Test results with the steels listed in Figs. 1, 2 & 3 indicate a lower total cost for the diamond wheel for BR-3, Ottawa 60 and AISI grades T-15, M-4, D-7 and M-3. D-2, even though it is a free machining type, was a borderline case, as was M-7.

In addition to lower cost, flatness and close tolerances can be readily maintained with the diamond wheel, while it is difficult to do so with aluminum oxide.





For all the die steels, (Fig. 1) diamond wheel grinding is equivalent or more economical, the differential increasing with vanadium contents of 4% or greater.

The same pattern exists with

the molybdenum-base high-speed steel types (Fig. 2). Vanadium contents of 3.2% or greater are more economically ground with diamond wheels. The exception to the general observation that at vanadium contents of 3% or greater diamond grinding is competitive exists in the case of the tungsten-base high-speed steels (Fig. 3).

This is probably a function of vanadium carbide volume, which is somewhat less in the tungsten-base high-speed steel system. Further exploration of these variables is planned to define more accurately the inter-relationships between carbide particle size and volume and grinding results.

Grinding Ratio

The grinding ratio, a measure of the ease of grinding a material with a given wheel, is the ratio of cubic inches of material ground per cubic inch of wheel wear.

For the BR-3 die steel, the grinding ratio of the diamond wheel was more than 250 times that of the aluminum oxide wheel, but only five times as efficient as the aluminum oxide wheel for the M-2 steel.

The free machining characteristics of D-2 and M-2 steels improved grinding efficiency with both types. In the case of D-2 steel, which was easiest to grind with both wheels, the effect cannot be assigned primarily to the alloy sulfides contained in the steel, since it is also the lowest in vanadium content.

Rate of Cut

A major cost element in comparing the two abrasive types is that of labor and overhead. The diamond wheel removed stock at an average rate of twice that of the aluminum oxide wheel. This is because the diamond wheel wears at an extremely low rate during grinding, and positive stock removal in relation to downfeed is approached only with the diamond wheel.

Rate of Wheel Wear

The relatively low rate of stock removal with aluminum oxide is caused by rapid wheel wear.

There was negligible wear on the diamond wheel for such steels as BR-3, Ottawa 60, T-15, M-4, D-7, and M-3 and M-7, while the wear on the aluminum oxide wheel was as high as 0.122 for only 0.100 total downfeed.

Surface Finish

Surface finish measurements were made on each steel after grinding with both wheels under the standard conditions of downfeed, crossfeed and table speed. The values in Table 2 taken transverse to the direction of the table travel show little consistent difference in degree of finish.

On some steels, the 100 grit diamond wheel produced the better finish, while on others the 60 grit aluminum oxide wheel produced a better finish. The finish on the tool steels was generally similar to the finish expected on tungsten carbide ground with a diamond wheel of this type.

An experienced operator would compensate for wheel wear in grinding a large workpiece so that over-all little difference in relative cost as a function of workpiece size might be expected in practice. However, final flatness could be achieved much more quickly on large workpieces with the slow-wearing diamond wheel, as was demonstrated.

Two additional diamond wheels of differing grit sizes but the same bond specification were tested, and the results compared to the 100 grit wheel used in the tests.

The effect of grit size was minor, with an indication that the 100 grit size is near optimum under these test conditions of 0.001 downfeed per pass. If stock removal rates were increased by increasing downfeed, the coarser grit wheel would probably be less drastically affected by downfeed rate on grinding efficiency ratio.

Discussion of Results

Although these results are based on laboratory grinding comparisons alone, an increasing number of shops are using diamond wheels in grinding the high vanadium tool steels. In most job shops, a variety of steels is ground on a machine tool, and it is difficult to obtain quantitative comparison data. But the diamond wheel continues to find increasing acceptance, since in many cases it enables the finishing operation to be done more quickly to close tolerances, freeing the machine for additional operations.

The most abrasion-resistant tool steels represented by the high-vanadium grades are being used for an increasing range of applications, and in larger and more complex designs. Any reduction in the associated grinding problems will enable more wide-spread utilization of such steels to reduce die costs in fabricating high volume production parts. ■

How to Increase Productivity

At a meeting of the Cleveland Chapter of the Manufacturing Engineering Council, Dr. Joseph Harrington, Jr., Head of the Mechanical Engineering Section, Arthur D. Little, Inc., Cambridge, Mass., spoke on "Manufacturing Engineering as a Spur to Productivity."

Suggestions he elaborated on:

1. Increase production by more intensive sales efforts.
2. Make more units per hour to lower cost and raise efficiency.
3. Use foreign labor (if you must) like the watch industry does (all watches are made abroad).
4. Use bigger, better and more capital equipment.
5. Give industry more capital by cutting taxes on equipment and profits, and offer tax advantages to companies that retrain displaced workers.
6. Stop the government from breaking up companies that are big enough to carry on manufacturing research.
7. Make better products by better methods and new skills.

'Ramron'

Fig. 1 The bearing part processed here had a 25% reduction in its grinding cycle.

Fig. 2 Corner-holding ability of this wheel shows grinding conditions. Cut was from solid steel.

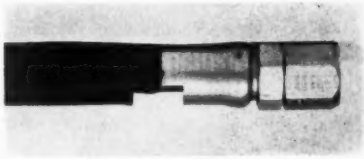


Fig. 3 This slot was cut in steel and rubber simultaneously without loading the wheel. Cut is clean in both.

Regardless of the ingenuity of designers of chipmaking machine tools, performance is and always will be dependent on the efficiency of the basic work contacting component — the cutting tool or grinding wheel.

Here's a new grinding wheel that may demand an increase in machine tool operating speed to utilize peak efficiency. Besides extremely fast material removal, it has other unusual claims to fame. This wheel, called Ramron, has just been released after three years of R&D.

Holds Form: Field tests have proven the excellent form holding qualities of the wheel. One production test produced 80 formed edges, where a comparable conventional wheel produced 24 per wheel dress.

Increases Removal: Faster and deeper cuts can be taken due to higher permissible feed rates. Production rates can be increased across the board.

Combines Operations: This new plastic bonded abrasive resists loading so well that rough and finish cuts can be combined with superior finish.

Offers Cooler Action: Even with plunging in at greater feed rates and increased sfpm, cuts are cooler, reducing heat checking and workpiece damage.

Improves Finish: Since this wheel concept is able to offer unusual stability, uniform finish can be expected from part to part for more pieces.

Needs Fewer Dressings: Resistance to loading cutting surface of the wheel greatly minimizes the number of dressings for production runs, and consequently greatly improves efficiency.

Increases Speed: In one of many controlled tests, a 7 x ¼ x 1¼" wheel was speed checked to the maximum 14,000 rpm capacity of the machine, 26,000 sfpm without breaking. Not only does this factor help increase production, but it also offers greater operator safety.

At this writing there are hardly more than platitudes available to the press, but we understand R&D has gathered volumes of interesting and valuable performance data. By our next issue deadline, The Osborn Manufacturing Company may be ready to release more information concerning what seems to be a major breakthrough for grinding. Osborn will respond if you circle Inform-A-Gram No. E2 on the reader service card.

We Make a Surface Plate

by Adolph H. Kleinsorge

Mr. Kleinsorge is chief engineer of W. B. Knight Machinery Company, St. Louis, Mo.

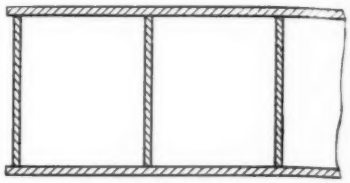


Figure 1

A WELDED STEEL SURFACE PLATE, designed and built in our own plant, has provided an excellent combination of accuracy, life, and portability. These qualities are needed in the manufacture of beds, columns, and other major members of our precision machine tools.

Our surface plate design takes advantage of the stiffness inherent in a structural beam. This effect is due to the "closed box" nature of the plate, which has interior reinforcements and two parallel working faces, Fig. 1. Each working face serves as a tension member.

Why Did We Undertake Such a Project?

The usefulness of a surface plate depends on its ability to remain flat, especially when moved about and used in various positions. Today's machines—jig borers, grinders, boring mills—demand surface readings in tenths and millionths.

Stone surface plates retain their accuracy for long periods, and are widely used as stationary tables, but are usually too heavy for portable use.

Cast iron and semi-steel plates are used as stationary and portable equipment. They usually are cast with integral ribs to resist deflection. These ribs have pronounced draft angles, and other thickness variations, Fig. 2. Such cross-sectional variations are detrimental to the plate's stability.

We knew that cast iron surface plates change almost continuously, due to stresses caused by temperature change, the lack of metallurgical homogeneity, and cross-sections which are not symmetrical about the neutral axis.

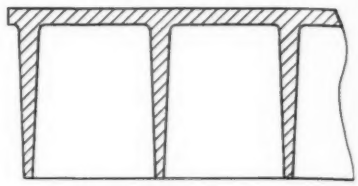


Figure 2

A cast iron surface plate is often exposed to alternating stresses. This can easily happen when the plate is used to check top surfaces of large machine members, Fig. 3. If the casting is not homogeneous and completely free of hard and soft spots, a change of position will cause uneven deflections as stresses in the ribs shift from compression to tension.

When a cast plate has undergone a thermal strain or has been loaded to the point of taking a "set," its surface will not be true when conditions are first relieved. It should be left to "settle" before it is checked or scraped. An endless cycle of checking, scraping, checking and settling wastes hours of skilled labor.

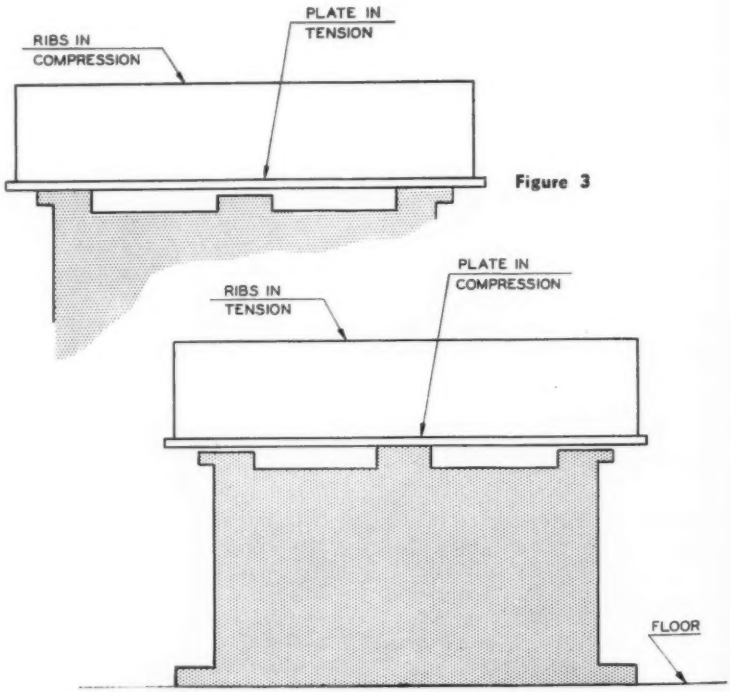


Figure 3

Based on an award paper submitted to the machine design competition sponsored by the James F. Lincoln Arc Welding Foundation, Cleveland.

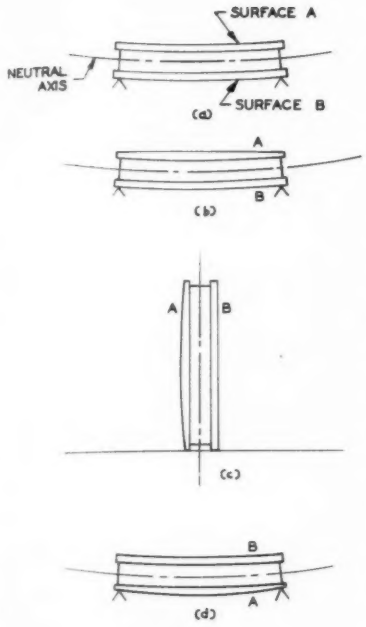


Figure 4

Design Solution to Our Problem

We decided to investigate the problems of surface plates by using the deflection formula for a beam of uniform loading, supported at the ends.

$$\text{Deflection} = \frac{5}{384} \times \frac{WL^3}{EI}$$

where,

W = Total weight of the surface plate
L = Length of surface plate
E = Modulus of elasticity
I = Moment of inertia of cross-section

Our study revealed that deflection will decrease when "W" is reduced, "E" or "I" is increased.

A box section would be an ideal way to increase "I". But a true box with internal ribs cannot be cast, so welded steel construction looked like a natural to us.

Steel would increase "E" from about 16,000,000 (for cast iron) to 30,000,000. Since steel can be fabricated of thinner sections, "W" could be maintained or reduced.

Would a welded steel surface plate be stable? Even though we had never heard of one, our experience with arc welding gave us confidence to proceed.

Surface plates are often used inverted, and we knew the deflection of an inverted plate would be double that shown in the formula, all things being equal.

It is almost impossible to support a large metal plate completely free of deflection; see Fig. 4 (a) where surface A is concave along with the plate's neutral axis. Scraping the surface flat, view (b), changes its relation to the neutral axis. Standing the plate on end, view (c), relieves the stress. The neutral axis is now straight, while the scraped-flat surface A is now convex. View (d) shows the surface plate completely inverted as it might be if applied to a large machine base. If irregularities in the workpiece surface provide bearing support only at the extremities, the deflection of scraped surface A is increased to twice that shown in view (a). Tests have verified this conclusion, which shows the importance of keeping original deflection to an absolute minimum.

Our immediate need was for a 48" × 48" surface plate to scrape the ways on the base of our jig borer. We made a layout, Fig. 5, of a welded steel surface plate.

To determine what deflection we might expect with this plate, we applied the formula:

$$\text{Deflection} = \frac{5}{384} \times \frac{WL^3}{EI}$$

Thus,

$$\text{Deflection} = \frac{5}{384} \times \frac{1460 \times 48^3}{30{,}000{,}000 \times 1243.5} = 0.000056$$

Since no cast iron plate of this size was available for comparison, a hypothetical section was assumed using the same weight.

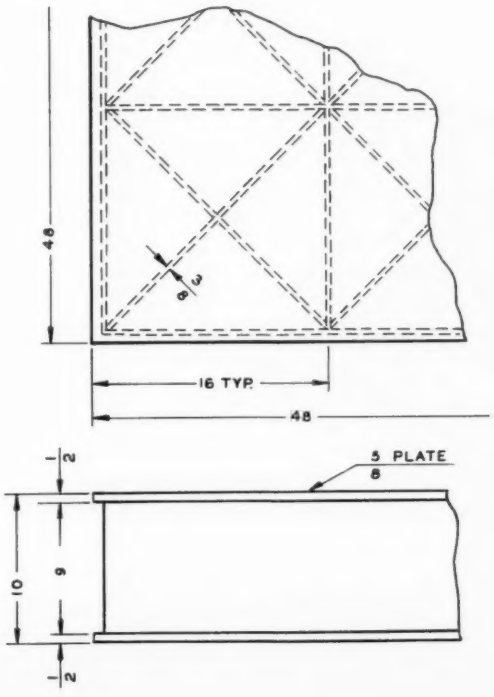
$$\text{Deflection} = \frac{5}{384} \times \frac{1460 \times 48^3}{16{,}000{,}000 \times 660} = 0.0002$$

The welded steel plate showed a 350% improvement over the cast iron design!

A study of the layout revealed these other advantages of the welded steel surface plate:

1) Since the cross-section was symmetrical about the neutral axis, alternating compressive and tensile

Figure 5



stresses would not affect the accuracy of the plate.

2) Metal sections of uniform thickness would keep thermal errors to a minimum.

3) There were no exposed edges of ribs to respond rapidly to thermal changes.

4) Soft-hard and strong-weak areas were replaced by homogeneous material.

5) Two surfaces on the plate could be used, but need not be absolutely parallel. One surface could be used for rough scraping, and the other reserved for final scraping and checking.

6) A welded steel plate would be easy to alter at some future date by welding or cutting. This would require machining and scraping, but would be cheaper than making an entirely new plate.

7) No pattern would be necessary. Most surface plates in the larger sizes are tailor-made, so this would be quite a saving.

Fabrication of the Steel Plate

The welded steel design looked so good that management decided to built the plate, Fig. 5.

Properties desired in the steel were stability and wear life. Steel should retain its original hardness after stress relieving, which indicated a low carbon alloy. U.S. Steel constructional alloy "T-1", firebox quality, was chosen as the most suitable for fabrication. This is a well controlled steel with the same physical characteristics in both longitudinal and transverse directions after heat treating. The product can be quenched and tempered for the following properties:

Yield strength	100,000 psi minimum
Tensile strength	115,000 to 135,000 psi
Elongation in 2"	18%
Reduction of area	50% minimum
Average Brinell hardness	277
Modulus of elasticity	30,000,000

Low carbon steel of suitable alloy produces a low carbon martensite for excellent ductility and stability after heat treatment. Resulting hardness of such a material improves wear of surface plate, and saves hours of rescraping.

Our welder was instructed to cut all ribs and end plates of the same height, and to machine the edges if necessary. This insured a uniform amount of weld at all joints. The center ribs were welded first, and successive ribs added from inside out. End plates were plug-welded to the adjoining ribs. Continuous welds were used all around except at these plugs. This gave support to top and bottom plates, and maintained a uniform arrangement.

All compartments were vented by drilling ¼" holes in ribs and sides to prevent air pressure from building up.

We stress relieved at 1000°F, and removed from the furnace to air cool at 800°F. The surface plate was bedded in sand to prevent warpage. This method of stress relieving proved satisfactory.

The ⅛" for finish on top and bottom was enough to clean up all surfaces. This minimum allowance represented savings in material and labor. After machining, the plate was hand scraped to an accuracy of 0.000050.

Fig. 6 shows the difference between the box section of the welded steel plate and the exposed ribs of the cast iron plate. Manufacturing costs of these items were as follows:

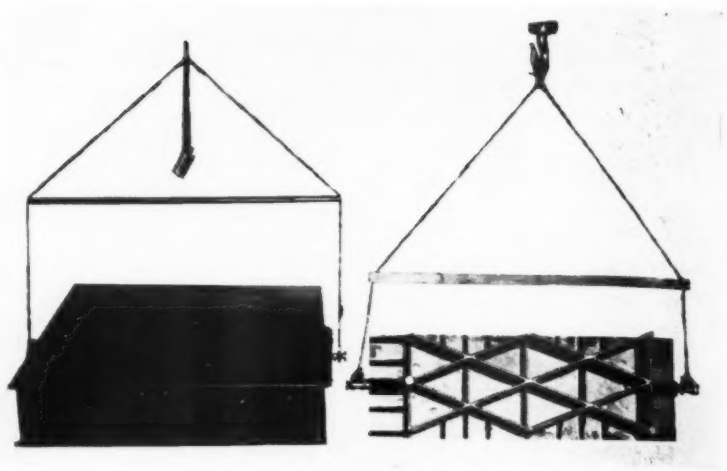


Figure 6

Weldment, Labor and Material	$ 953.00
Stress Relieving	32.80
Machining	96.00
Scraping	288.00
	$1369.80

Testing and Results

To test, the welded steel surface plate was supported over a master stone plate, using a three point suspension. The bottom of the plate was checked with a tenth dial indicator from the stone plate. The maximum error detected was 0.0001. The temperature rose 10°F after the plate remained this way for 4 hrs. Another check was made. It showed only the 0.0001 error.

Tests on the steel surface plate were completely satisfactory. It was put to use immediately and proved to be equally satisfactory under service conditions.

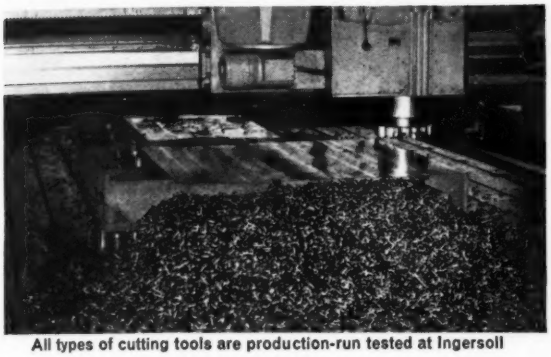
Our cast iron plates had been rescraped several times a week to keep them true, but our steel plate is rescraped only every two or three months, depending on its use. It takes 12 hrs to rescrape one side of this 48" square plate.

The principles used in the design of this steel surface plate are simple, but basic. It is my conviction that as industry builds larger machines to even greater accuracy, welded steel box sections will be used more commonly on bases and frames, since they are, in effect, "surface plates." ■

HOW TO INCREASE COSTS A FEW DOLLARS AT A TIME

Under the guise of "cutting costs" you may save pennies while having dollars picked right out of your pocket. Just close your eyes to the productive potential of a machine. Use relatively ineffective working components and overall costs will be increased a few dollars at a time.

Cutting tools for milling machines are sometimes a good example: The purchase of the machine represented a sizable expenditure. It was justified because of the work it was expected to do, the contribution it was expected to make to the company's profit. Then someone got the idea that a change of blades or cutters would save money. It might, but the danger is that making the substitution may actually reduce the potential performance of the machine. It may make the much larger machine investment less profitable than it should be—may *in total* increase annual overall costs, rather than reduce them. The total effect can only be known after a complete analysis of all of the factors involved.

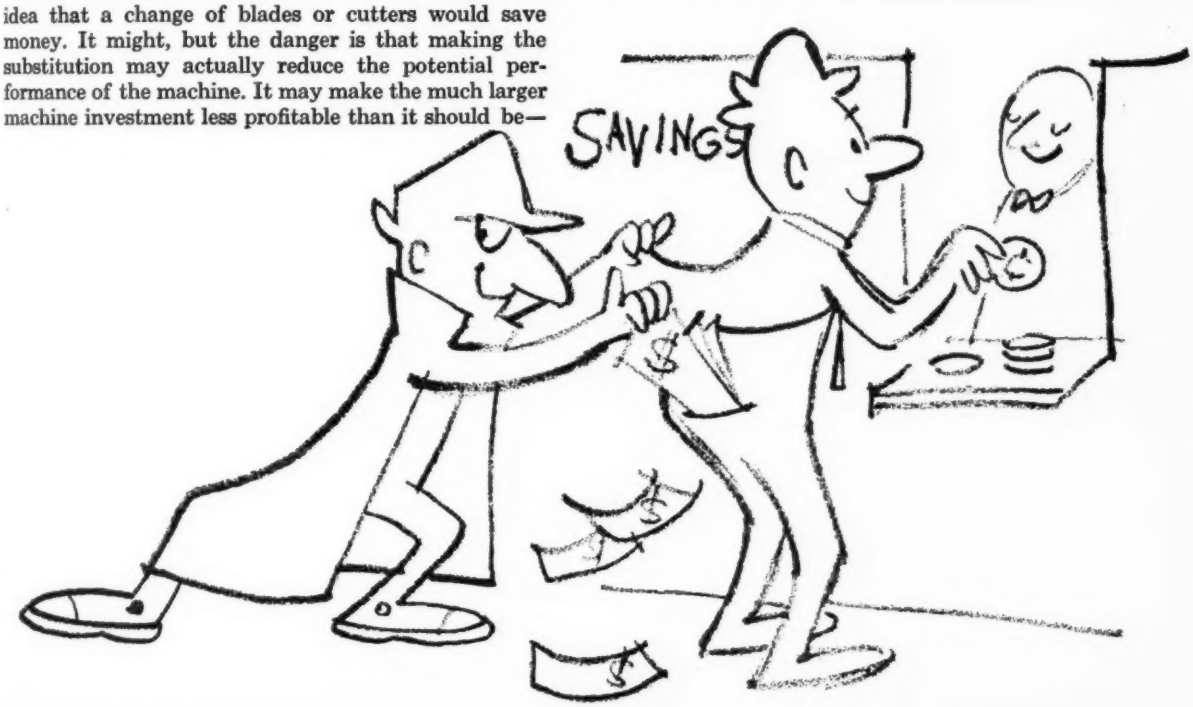


All types of cutting tools are production-run tested at Ingersoll

There's a way to be sure you're NOT increasing costs a little at a time—to be sure you ARE getting maximum machine and cutter performance and minimum costs at the same time.

Ingersoll has one of the best milling cutter and blade testing laboratories in the world. It is the shop where Ingersoll builds, erects and tests special machines. Here milling cutters and blades of virtually every type and kind are continually being evaluated. The Cutter Division's blade and cutter design and manufacturing facilities are unsurpassed.

However, the true test of cost and performance must incorporate all the conditions and objectives in each user's shop. Ingersoll is equipped and prepared to help the customer determine the *right* blade or cutter for each requirement and to supply them at the *right* place and at the *right* time. Ask to have an Ingersoll sales engineer tell you about the Ingersoll Cutter Service and the Blade Back-Up Program. Write: **The Ingersoll Milling Machine Company, Cutter Division, 505 Fulton Avenue, Rockford, Illinois.**



CIRCLE INFORM-A-GRAM KEY NO. 57

End Your Tool Steel Problems with the A-L STEELECTOR System

STEELECTOR

Save Selection Time, Insure Accuracy, Cut Inventory Costs

If you started using the new Allegheny Ludlum STEELECTOR Program first introduced last year, you know what savings it can bring. If you didn't, your competitors may have stolen a march on you.

There are many advantages in the STEELECTOR system. Perhaps most important is the savings in selection time. No longer need anyone spend hours in tool steel selection. By using one of the STEELECTOR Cards, an accurate selection can be made virtually at a glance. In seconds you can choose the tool steel grade with the particular combination of red hardness, abrasion resistance, size stability, toughness, and machinability required by the job at hand.

You can select STEELECTOR tool steels with confidence—they are always in stock. You don't have to stockpile tool steel. Instead, by relying on Allegheny Ludlum material and using STEELECTOR grades, you can reduce the variety of tool steels in your inventory. You reduce problems because the STEELECTOR offers the tool steels that are right for your jobs, eliminates those that contribute nothing but confusion.

STEELECTOR Cards Save Selection Time

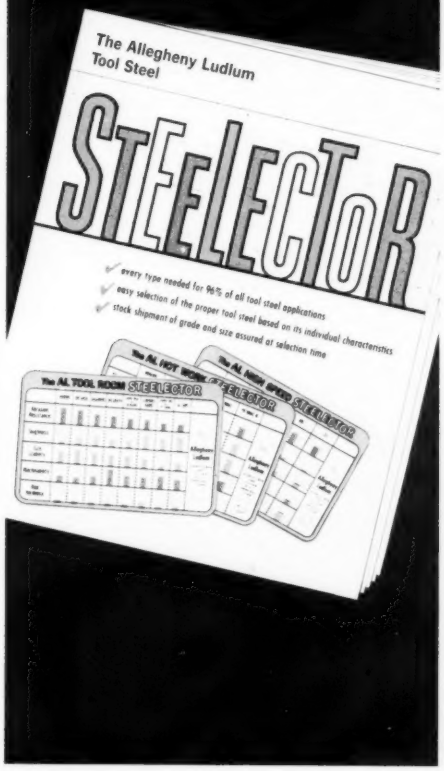
The three STEELECTOR Cards insure that you will pick the right tool steel for every application. Each STEELECTOR Card (there are cards for tool room, hot work, and high speed applications) uses bar graphs to indicate the relative abrasion resistance, toughness, size stability, machinability, and red hardness of the STEELECTOR grades. You can select the best combination of properties for the job at hand virtually at a glance.

STEELECTOR tool steels will meet your job requirements. You can clean house with the STEELECTOR Program. No longer need your stockroom be cluttered with small stocks of scores of grades. No longer need you find yourself holding grades that require different processing, yet give the same results. And you never need to worry about running short. Allegheny Ludlum STEELECTOR grades are always in stock.

STEELECTOR Program Ends Supply Problems

Huge warehouse stocks back up Allegheny Ludlum's STEELECTOR Program. You know before you order that the grade you have selected is in stock, in the size you choose. Here's how the STEELECTOR System works:

First, you select the right tool steel for your job by using a STEELECTOR Card. Then you check the STEELECTOR Data Stock List for the particular grade selected best for your job. (There is a List for each of the 18 STEELECTOR grades.) All sizes and shapes in stock are listed along with hardening, tempering, and annealing temperatures. The List also gives the typical analysis of the steel, its AISI number, and describes its properties. Typical applications are listed along with suggested working hardnesses to confirm your selection.



Free Booklet Explains the STEELECTOR System

You will find a complete description of the STEELECTOR Program in this colorful 10-page Allegheny Ludlum booklet. It tells how the STEELECTOR System helps you pick the right tool steels, save time, and end your supply worries.

Each of the STEELECTOR grades is listed in the booklet along with its description, applications, and AISI type number. Included are three handy STEELECTOR Cards that will save you time in picking the right steel for tool room, hot work, and high speed applications. Everyone who helps select tool steel needs this booklet. For your free copy ask your A-L representative, or write: Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pennsylvania. Address Dept. TS12.

What Can The A-L STEELECTOR Program Do For You?

Whether you are president, purchasing agent, stock room supervisor, engineer, or heat treater, you will find the STEELECTOR System can save you time, reduce costs, and make your job easier. Check this list and see how the STEELECTOR System can help you:

Owner, president or vice president. Reduces costs in warehousing, purchasing, and inventorying. Insures selection of the right tool steel—prevents misapplication and wrong heat treatment.

Operating man, superintendent, foreman, production control man. Ends availability problems. Large local warehouse stocks enable your in-plant stocks to be reduced. Consistent high quality.

Engineer or metallurgist. Speeds selection of the right tool steel . . . saves the time formerly spent in selection for jobs that need it.

Specifier, designers, tool room man. Assures you of the availability of the size and grade you need. Only 18 grades to consider for 96 percent of all applications.

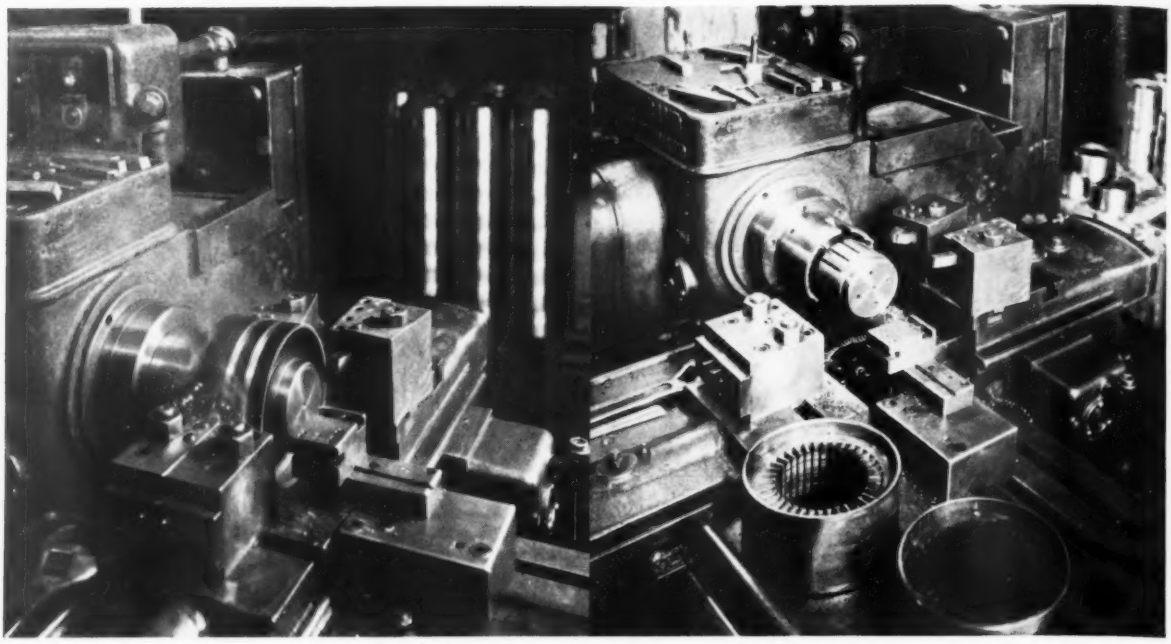
Stock room supervisor. Saves storage space because fewer grades need to be stocked. Ordering is simplified and paperwork reduced.

Heat treater. Helps you operate furnaces more profitably —more tools can be treated at a time.

Purchasing agent. Reduces paperwork and inventory needs.

To learn of all the benefits of the A-L STEELECTOR System, ask for the STEELECTOR booklet described in the adjoining column. 3297

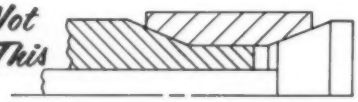
ALLEGHENY LUDLUM AL®



Chuck Internally within 0.0005-in. TIR... and get faster loading, higher speeds and heavier feeds!

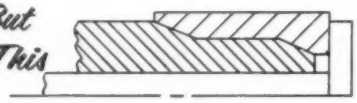
ERICKSON Expanding Mandrels

Not This

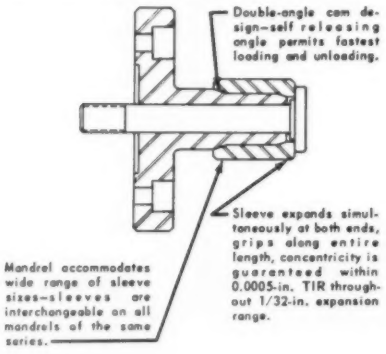


Concentricity poor—cam surfaces on 3 parts; tendency to rock.
Sleeve expansion not uniform.
Half of work and cutting load carried by drawbar.

But This



Concentricity assured—cam surfaces on 2 mating parts.
Sleeve expansion perfectly uniform.
All of work and cutting load carried by mandrel shank.


Double-angle cam design—self releasing angle permits fastest loading and unloading.
Sleeve expands simultaneously at both ends, grips along entire length, concentricity is guaranteed within 0.0005-in. TIR throughout 1/32-in. expansion range.
Mandrel accommodates wide range of sleeve sizes—sleeves are interchangeable on all mandrels of the same series.

You can take higher cutting speeds and heavier feeds when you don't have to worry about work slipping on the mandrel. With an Erickson Expanding Mandrel, you get unmatched holding power plus accuracy guaranteed within 0.0005-in. TIR—a combination that brings you lowest possible production costs. Loading and unloading are faster, too—because Erickson expanding mandrels collapse instantly for quick release—provide a full 1/32-in. clearance for loading parts. No need to sacrifice loading speed for close fit between mandrel and work.

You save on downtime with an Erickson expanding mandrel, because replacement sleeves come right off the shelf. A handful of replacement sleeves lets you handle a wide size range—and retain top accuracy year after year.

The Erickson expanding mandrel has much greater holding power than a solid mandrel or a single-purpose split arbor because it expands *uniformly*—grips over the entire sleeve length, not just in a narrow ring. To achieve this powerful holding action, Erickson uses an exclusive double-angle mandrel design. The hardened, precision-ground sleeve is forced back over two camming surfaces which expand both ends of the sleeve simultaneously.

Standard Erickson expanding mandrels cover a wide size range—from ½ through 18-in. in diameter. Many different models are available, including adaptations for small holes.

Write for the ERICKSON EXPANDING MANDREL CATALOG—it's free.

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CIRCLE INFORM-A-GRAM KEY NO. 60

Tellurium-Containing Steel Speeds Machinability

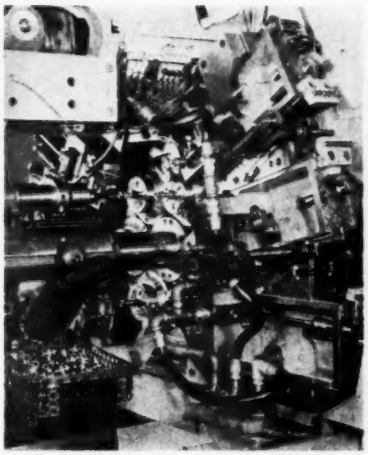


Fig. 2 Spark plug shells are being machined at 618 sfm at the six-spindle Conomatic.

A significant step forward in high speed machining is indicated by recent test conducted by three major companies. The results should stimulate the further development of steel bar and machine tools.

Record machining speeds, more than 3½ times as fast as the standard screw machine steel B1112, were reached using the new tellurium steel called LA-LED X. The tests convinced the companies involved that tellurium has beneficial effects on the machinability of steel.

In the manufacture of spark plug shells, the new tellurium containing steel was used in different heats. Spark plug shells are a common commodity, manufactured by the millions annually. This furnished considerable production information and gave a sound basis for comparison.

Fig. 1 "Almost unbelievable if I hadn't seen it with my own eyes," says R. R. Rhodehamel, VP at Cone Automatic Machine Co. He's discussing machinability results in front of the 1" adjustable slide, fast index Conomatic.

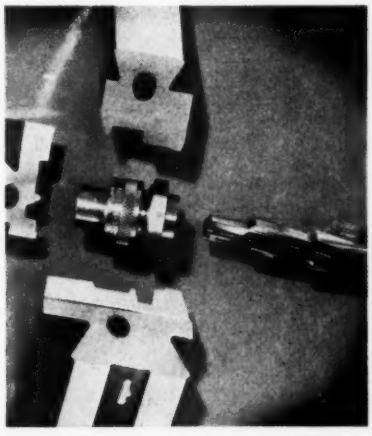
Experienced operators ran a new six spindle automatic screw machine. They used standard, high speed tools, T-5 grade, under ideal conditions. In spite of the extreme speeds there was no need for soluble oil coolants. A light oil coolant was used.

After sampling runs — turning, shaving, reaming, drilling, and knurling, final adjustments were made in machine and tooling.

Basic tests were then started at 528 sfm. This is twice the normal operating speed of regular production shops making spark plug shells. Feeds were also increased 1/3 over normal, or up to 0.0035. When the quality was excellent, speeds were further increased step by step to a record 618 sfm.

Tool wear was normal and the drills showed no appreciable wear. Inform-A-Gram No. E3. ■

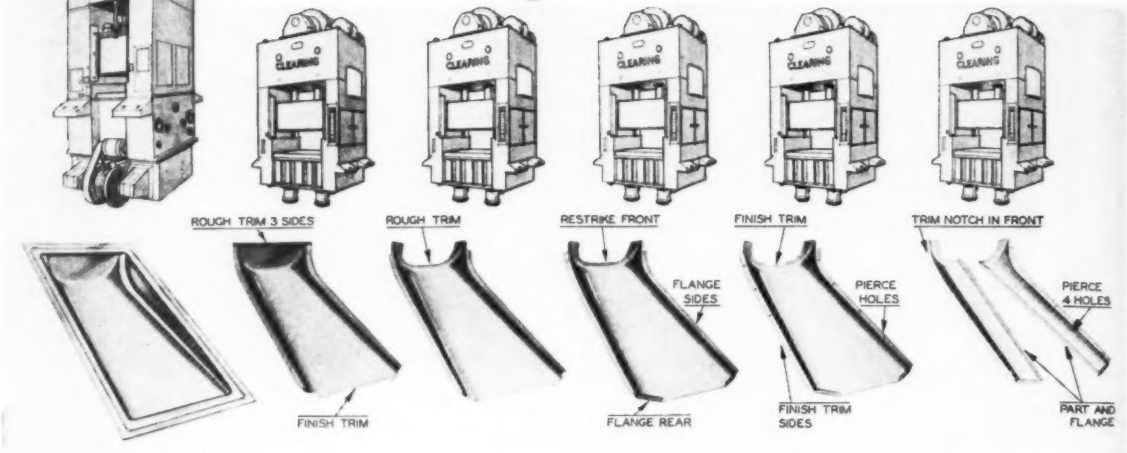
Fig. 3 Shown are the standard high speed profile tools used on an automatic screw machine to produce a spark plug shell.



The tellurium - containing steel was developed by Inland Steel Co., Chicago, who supplies it in hot rolled bars. LaSalle Steel Co., 1420 150th St., Hammond, Ind., processes it by cold finishing. Tests were conducted at Cone Automatic Machine Co.'s Windsor, Vermont plant.

Tellurium (TE) is a brittle, semi-metallic element of the sulphur-selenium family. The German chemist Martin Klaproth first recognized it as an element in 1792. It appears in the pure state, or combined with silver, copper-sulphite, gold, and nickel.

Even Tokyo Must Automate



First integrated automated fender production line is built in U. S. for Japanese auto company. The new giant press line represents largest single foreign order for American machines.

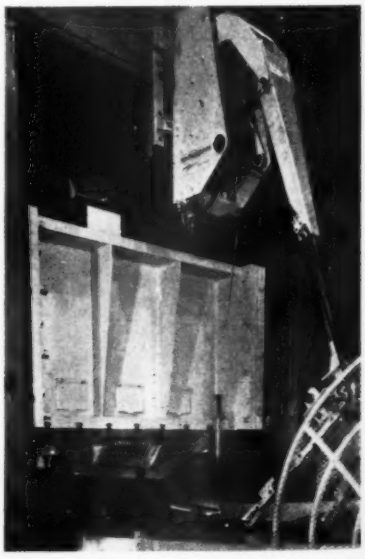
A HUGE AUTOMATED PRESS LINE—to be disassembled and shipped to Japan represents the largest single foreign order for American-built machinery on record, in terms of dollar volume. Designed and built by the Clearing Division of U. S. Industries, Inc., it will be used by the Nissan Motor Co., Ltd. to maintain a competitive position.

The need for automation in Japan was stressed by Mr. Takuro Endo, chief of Nissan Motors' new stamping plant in Oppama, near Tokyo. The new press line will be used to manufacture fenders for Datsun and Bluebird automobiles, sold all over the world.

"In spite of comparatively low Japanese labor costs, we have found automation necessary particularly because, in the face of increasingly competitive world trade conditions, our own production problems have been aggravated by an increasingly short labor supply in the last couple of years," Mr. Endo said.

The USI Clearing line consists of six presses connected by automatic transfer mechanisms, and weighs 700 tons — roughly the equivalent of seven jet transport planes. The entire automated line requires only two operators, compared with conventional non-automated press lines on which at

This view shows a Press Automated Systems work handling arm that automatically takes work out of press. These and other innovations make it possible for this complete line to be operated by two men.



The automatic transfer mechanism of the world's first fully integrated automated production line for automobile fenders — custom built for a Japanese car maker.

Sequence of Operation

The draw press will complete the first "draw." A blank is automatically placed in the die from a sheet loader directly in front of the press, and a limit switch will start the press. The stamping is removed from the die by an iron hand and placed in position on a shuttle feed. This will be automatic by means of a limit switch. After the stamping is placed on the shuttle feed and oriented in position, it goes to a turnover station and is positioned for subsequent operations. From there it goes by shuttle feed into the die of the first single action press for operation 2.

After the stamping is oriented on the punch of the first single action press, the press will make its stroke. After operation 2, an iron hand removes stamping to position it on the shuttle feed again. It will then go to operation 3. The same action will take place for the fourth and fifth single action presses to complete the part. The complete line will operate automatically with presses stroking intermittently and timed by the stamping as it moves progressively through the line.

least two men operate each press.

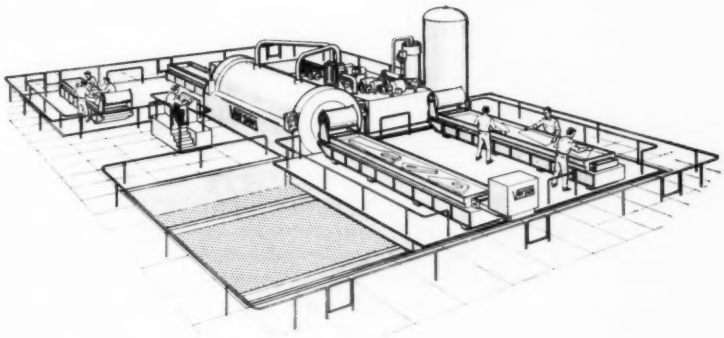
At the push of a single button, individual steel sheets are automatically fed into the press line and emerge as fully formed parts. The line's hourly production rate is 1200 units.

Mr. John R. Bartizal, president of Clearing, says the line is one of four Nissan ordered at a total cost of nearly $5-million. All shipments will be accompanied by technical groups from Clearing, to help get the lines into production.

A 63,000-ton Punch, Hot or Cold

A giant that weighs almost a half-million lbs, has more than 2000 gal of hydraulic fluid coursing through its system, travels on seven railroad cars and delivers a 63,000-ton punch is the talk of the "hydraulic-press-set."

After 14 months on drawing boards and in construction, the 41,000-ton capacity behemoth, a Verson-Wheelon direct acting hydraulic press, will work for Grumman Aircraft, Bethpage, Long Island, N.Y., in forming metal components for missiles and aircraft.



Main body of the press is a laminated cylindrical pressure vessel that withstands extreme internal stress. A fluid cell inflated with hydraulic fluid is mounted in the roof of the pressure cylinder to provide forming force. The pressure is exerted on metal blanks arranged on a tray that has been moved into the cylinder.

Blanks are arranged around form blocks and are shaped when the fluid cell expands to fill the void. Missile and aircraft frame sections and structural units are completely formed.

There are four trays. While one is in the pressure cylinder, three are available for loading and unloading parts. Two trays are used for cold forming. The remaining two have heater elements that heat blanks up to 600°F.

Each 50 x 168″ tray can form components as large as those overall dimensions. The cold trays can form to a 10″ depth and the hot ones to 6″.

The press is operated from a master control console or from two auxiliary stations. Operators are in telephone contact with each other. From the stations all trays can be maneuvered in four directions, both in and out of the cylinder and laterally. It takes less than 2 min for a complete cycle to produce a tray of formed parts.

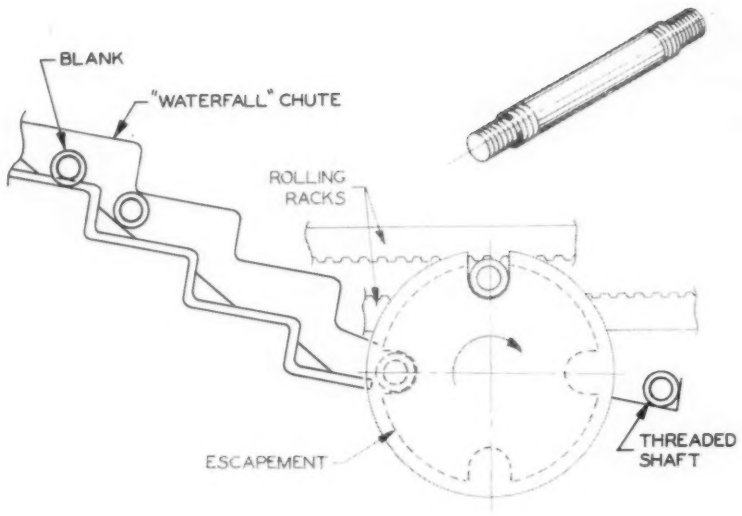
Gray Iron Awards

R. M. Gold's substitution of gray iron for a fabricated steel knife slide on a shell trimmer won him first prize ($500) in the 1961 Design Contest sponsored by the Gray Iron Founders' Society.

The change brought substantial savings, weight reduction and improved appearance. Mr. Gold works for Dayton Rogers Co., Minneapolis, Minn.

L. F. Fougere and W. B. Moyer of the General Electric Co., Schenectady, N.Y., shared second prize for improvements in the design of a bearing and inlet casing for a compressor of a gas turbine.

There were six third prize winners. Awards were made at the Association's Annual Meeting in Toronto, Canada. The contest is part of the Society's over-all product promotion program. It serves to educate users to natural advantages of gray and ductile irons.



Two different blank diameters alternately roll on separate chute surfaces to assure proper alignment. Live headstock and tailstock centers transfer blank from load position in escapement to working position between the racks.

Automatic Loader and Locator Hikes Production

Production has been boosted to 470 parts/hr in a typical application of a new device that loads, locates and unloads long slender pieces in thread rolling machines. With manual loading, the machine turned out about 300 pcs/hr.

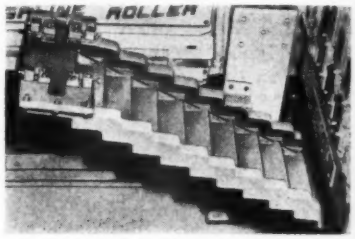
Blanks are introduced at the top of an unusual "waterfall" chute that prevents excessive rolling speed or jamming. Each time they go down a step, shafts are slowed and straightened across the chute.

The chute leads to a barrel-shaped escapement mechanism that has four axial slots along its periphery. As the barrel indexes, one part enters the slot and is rotated 90° upward to the load position. The blank is picked up by live headstock and tailstock centers and inserted into the machine.

The head- and tailstocks return the part to the same slot in the barrel after it has been cold-rolled. Following the next index, the finished part rolls out of the barrel and slides down to a belt conveyor. All loader and machine motions can be electrically interlocked through limit switches so that the cycle is automatic.

The drawing shows the new loader adapted for handling lower control arm shafts of auto steering mechanisms. Blank shafts are loaded into a Roto-Flo machine where four threads—two each of two diameters—are cold rolled in a single pass of the forming racks.

The new loader was designed and built by Gear-O-Mation Div., Michigan Tool Co., Detroit.



Machine loading is automatic after operator places blanks in slot at top of "waterfall" chute.

Press Increases Production

Production has been increased 36% at Ansco's Binghamton, N.Y. plant in the manufacture of caps for 35 mm film spool magazines.

The parts were formerly produced on a progressive die and a standard press.

The company selected a Model 2-19 Baird transfer press to reduce tool maintenance downtime.

In operation, coiled stock is automatically fed into the transfer press in predetermined feed lengths. A nine station die set performs blanking, first forming, scoring, trimming, piercing, extruding, crimping, and ejecting.

The press has a 15-ton capacity and a standard transfer stroke of 1¾". Recommended work load is 9 tons with maximum transfer stroke of 2½". The machine accepts up to 2¾" wide coiled stock.

Write the Baird Machine Co., 1700 Stratford Ave., Stratford, Conn., or circle Inform-A-Gram No. E4.

From left to right operations are as follows: blank, first form, score, trim, draw, pierce, extrude, crimp and eject.

Tools Around the Workpiece

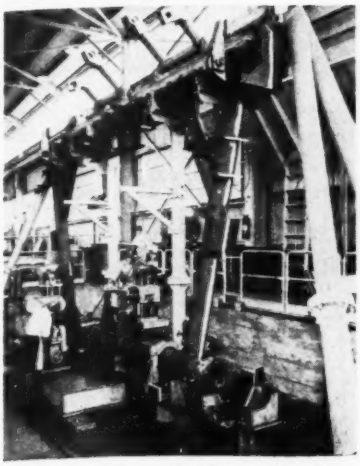


Fig. 1 Gigantic holding tool with Master Machine units in work position. Various machine tools do boring, milling, facing, and reaming operations on big Atlas ICBM launching frames.

At Consolidated Western Steel Co.'s Maywood, Calif., plant they move the machine tools around the work, instead of the opposite.

Reason for this switch from the conventional method is that the company (a subsidiary of U.S. Steel Corp.) constructs massive launching frames for Atlas missiles, too heavy to be mobile.

The company uses three Master Manufacturing Co. FT-6 feed tables mounted with two LC-6 machining heads, one for boring and one for milling, and a PMH-7 machining head to face the giant frames. The machining head and feed table move around the frame.

Pallets are located around the frame, and steel locating cones are sunk into them to exact specifications. Bases are fitted to the feed tables with female end connections for the cones. The machining unit is movable by overhead crane in minutes, without further adjustment. Close tolerances are maintained by positioning heads on precision locators.

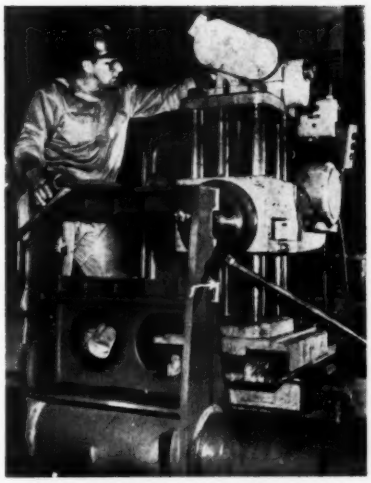


Fig. 2 The LC-6 in position for a milling operation.

Welding Foundation Awards Announced

Fifty-three undergraduate engineering students representing 29 colleges and universities in the U.S. were named winners in the annual Engineering Undergraduate Award Program for Arc Welded Designs of Machines or Structures sponsored by the James F. Lincoln Arc Welding Foundation, Cleveland.

The students received awards totaling $10,000 in this design competition established by the Foundation in 1947 to stimulate interest, scientific study and research in the practical design and use of arc welded steel.

Entries for the design competition were in two separate, noncompeting divisions; machinery and structural. Awards are given for papers describing the design of a machine or structure in which the efficient use of welded steel has improved performance or appearance or reduced cost.

Roland W. Gerstenberger, electrical engineering student at the University of Miami, Miami, Fla., led the Machine Division with a "Design Study of a Welded Engine Block." Gerstenberger used steel's premium mechanical and physical properties and the flexibility of arc welding as a fabrication technique to reduce weight and machining operations and control production costs. His paper won the $1500 First Award.

The $1500 First Award in the Structural Division went to James M. O'Neal, architectural engineering student at Rensselaer Polytechnic Institute for his paper "All Welded, Prefabricated Space Frame."

Casting vs. Machining

Investment casting has replaced intricate machining operations, and is credited with 20% savings in piece cost, at Double A Products, Manchester, Mich.

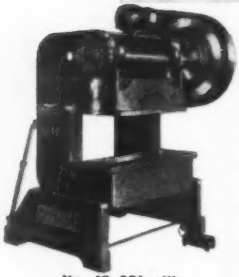
The company employs precision investment casting to produce a sleeve for a high-pressure operating valve used in air cylinders and hydraulic assemblies. The sleeve, nominally 1 9/16" long and 3/4" dia, has six 3/32" highrings: two 3/16" wide end ones, and four that are 3/32" wide. At each quadrant, a row of five 1/8" holes are located between the rings, extending through to the 9/32" lengthwise bore of the sleeve.

The sleeves were formerly grooved from Carpenter RDS tool steel on a screw machine, with the small cross-holes and center bore drilled separately.

At Casting Engineers, Chicago, Ill., the parts are now investment cast with holes precisely located. The only machining necessary is center bore reaming and light surface grinding. Material used is 6150 alloy steel. More information from Casting Engineers, or on Inform-A-Gram No. E5.

High-Output with ROUSSELLE

DOUBLE-CRANK PRESSES



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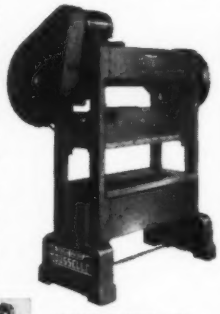

Choice of over 30 models and types in 5 to 60-ton sizes

STRAIGHT SIDE – Die space up to 24 in.; bed space up to 6 ft. between uprights.

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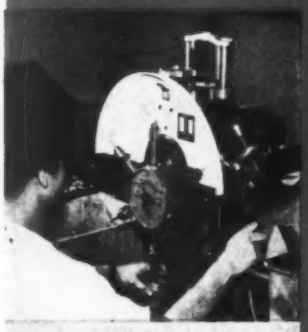
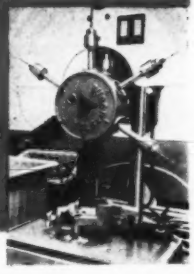
Burgmaster BENCH MODEL TURRET DRILL



Saves 89% of Equipment Cost... Increases Production 120% for Prest-o-matic

Pays for itself in Four Weeks- Saves Handling Time, Operator Fatigue and Valuable Floor Space

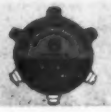


JOB FACTS

Company: Prest-O-Matic Company
Machine: Burgmaster Bench Model Turret Drill
Part: Die Cast Aluminum Valve Body
Lot Size: Continuous – 220 per day
Holding: Special Fixture
Special Attachments: 2 Burgmaster "3000" Tapping Heads
Production Rate:
Former Method: 4 Single Spindle Drills
Former Production: Valve Bodies – drill 8 – tap 3 holes – 100 per day
Present Method: Burgmaster Bench Model Turret Drill
Present Production: Valve Bodies – drill 8 – tap 3 holes – 220 per day
Production Increase: 120%
Other Advantages: Less handling time, less operator fatigue, 75% less floor space

When the Prest-O-Matic Company, Santa Ana, California tooled up to drill 8 holes and tap 3 in their die-cast aluminum valve bodies, they selected a Burgmaster Bench Model Turret Drill to save 89% of original equipment cost, and increase production 120% over the output of 4 single spindle drill machines. Savings in production costs paid for the Burgmaster Bench Model in just 4 weeks of operation. Additional savings reported by Prest-O-Matic include less handling time, less operator fatigue, and a 75% saving in floor space.

Send for Literature



BURGMASTER CORPORATION
Small Tool Div., Burg Tool Manufacturing Co., Inc.
13226 S. Figueroa St., Box 311, Gardena, Calif.
Phone: FAculty 1-3510 Phone, wire or write Dept.OA

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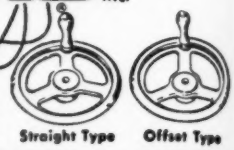
Tomco INC.

HAND WHEELS



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Save money by grinding Straight or Spiral Drills, Reamers, End Mills, Milling Cutters from solid with our Model 90FS Flute Grinder.

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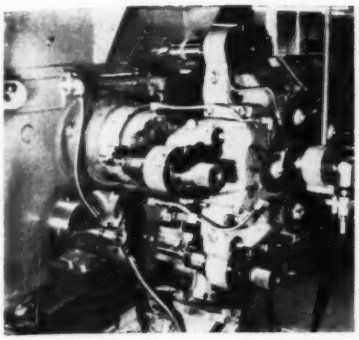
Mass Production Benefits For Short Runs



Single spindle chuckers can now be used on runs as small as 25 pcs, according to Scully-Jones & Co. The Chicago firm says its "Quick-Set" tooling, which reduces job change-over time between 50 and 75%, can bring mass production benefits to such short runs.

A job that normally might take 4 hrs to set up on a chucker now can be tooled and ready to run in half the time. Repeat setups might average 30 min or less—from installation of chuck jaws through machining of the first piece.

All cutters are preset in the holders using bench gages. Dimensions for settings are programmed on layout drawings. Thus, while the machine is producing, cutting tools for another job may be made ready to produce accurate parts quickly, on the very first cut after change-over.

No wrenches are needed to install the toolholders. Holders for end cutting tools are inserted into hydraulically actuated chucks. Cross slide tools are held in magazines and clamped in place by heavy disc springs. Spring pressure is released by the action of a hydraulic piston.

Fig. 2 Setup man works from layout drawings. All tools are preset to base lines that have been established on the machine.

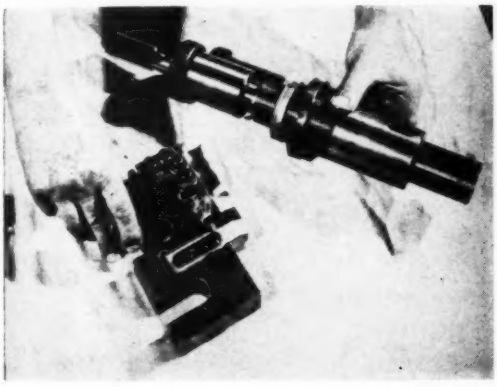
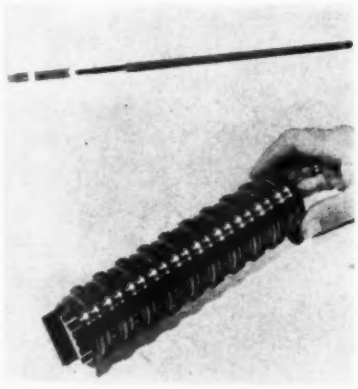


Fig. 1 Cross slide tool magazine at left is clamped by heavy disc springs, while turret toolholders for end cutting operations are held in hydraulic chucks.

Scully-Jones guarantees their new system to hold machining tolerances to ±0.001. Closer tolerances are possible in actual practice, they say.

A side benefit of Quick-Set tooling is that the operator can visually check his cutters in seconds, and replace them without in-the-machine adjustments. Circle No. E6.

ID and PD Concentricity



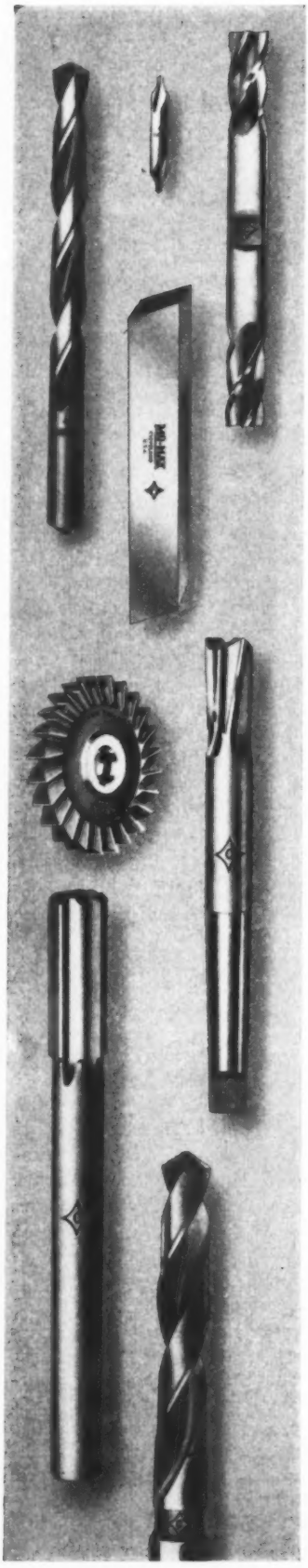
Manufacturing of internal splines and gears is simplified when ID and PD are truly concentric.

A new broach called the Red Ring concentricity broach is said to assure true concentricity, according to National Broach and Machine Co., 5600 St. Jean Ave., Detroit, Mich.

The tool consists of a roughing broach with a removable finishing shell on the end of the broach. The shell has alternate round and spline finishing sections.

The new broach shaves the tooth profiles to proper form and size, while the ID of the part is being broached to size. This simultaneous cutting action avoids common production problems such as back taper in the broach, relief on sides of gear or spline teeth, breakdown of cutting corners, machine misalignment or improper face grinding techniques.

Red Ring concentricity broaches are made to suit specific parts. They have splined holes or internal gears ranging up to 12″ PD. Naloy surface treatment is said to assure long service life. A finishing shell will outwear several roughing broaches. Inform-A-Gram No. E7.



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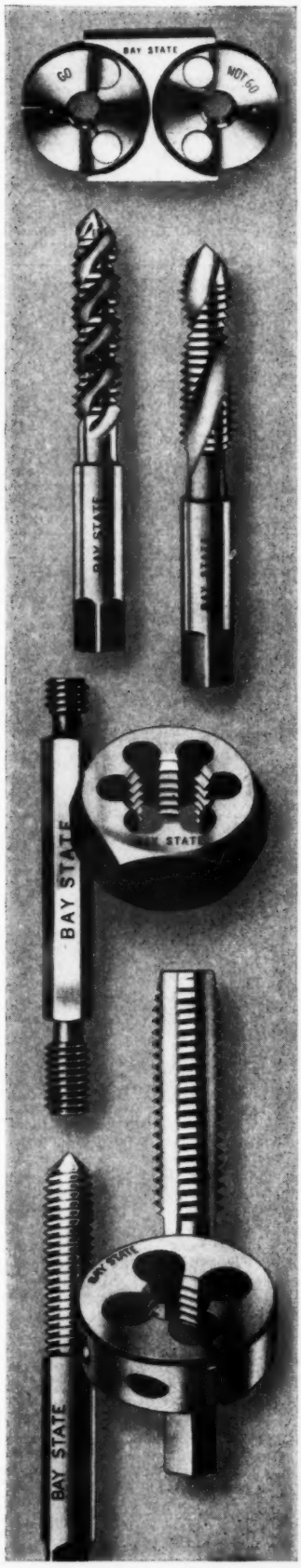

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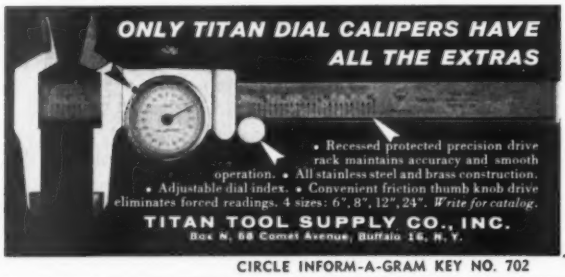

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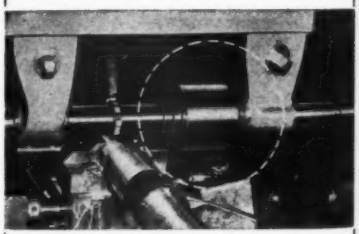

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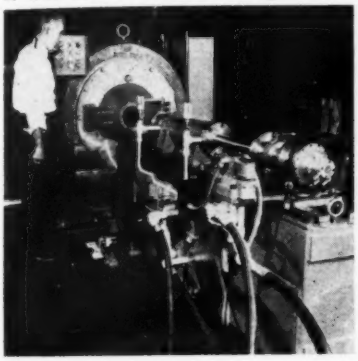
When used as a rotary swager, it will form nonferrous light wall



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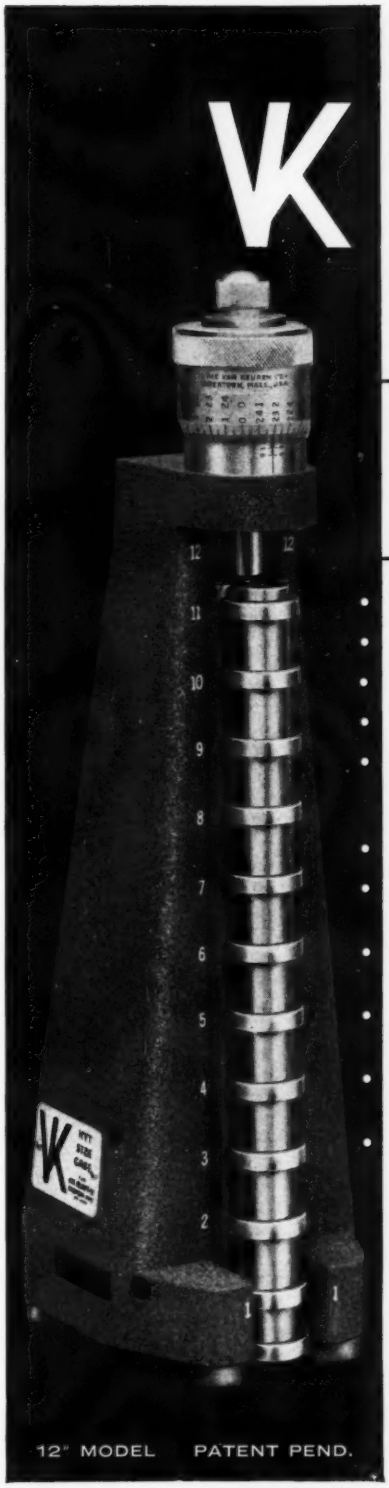
December 1 "Screw Injection Molding" meeting, Sheraton-Cleveland Hotel, Cleveland, Ohio.

December 2-5 Visual Communications Congress Technical Sessions, Biltmore Hotel, Los Angeles, Calif.

December 4 Machine Knife Association Annual Meeting, Savoy-Hilton Hotel, New York, N.Y.

December 3-6 American Institute of Chemical Engineers, 54th annual meeting, Hotel Commodore, New York.

December 6-8 Metallurgical Society of AIME, 19th Electric Furnace Conference, Penn-Sheraton Hotel, Pittsburgh, Pa.



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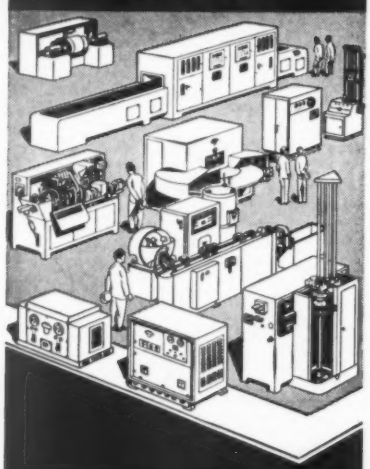

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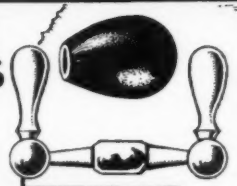

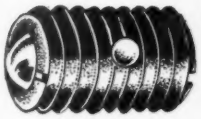

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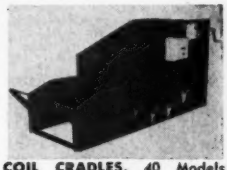

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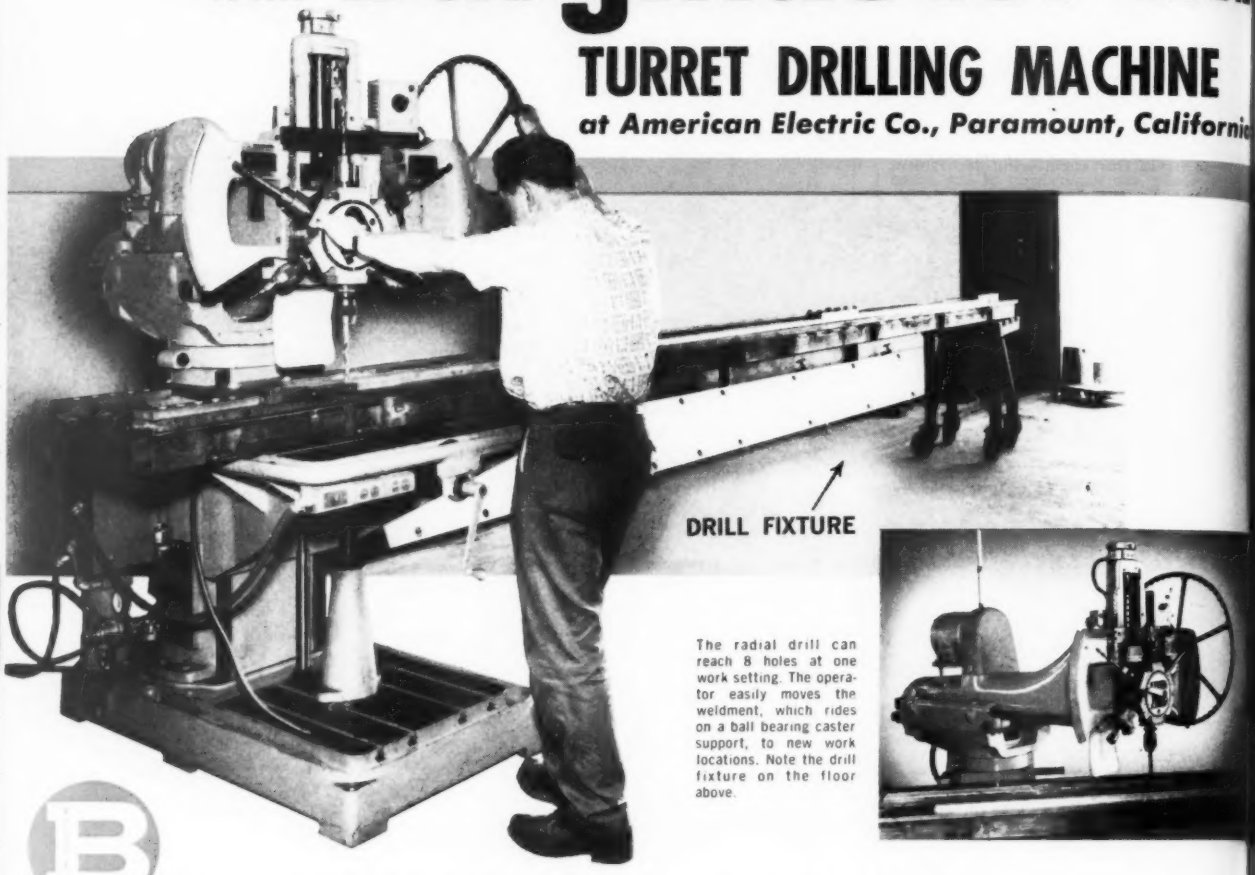
at American Electric Co., Paramount, Californi



The radial drill can reach 8 holes at one work setting. The operator easily moves the weldment, which rides on a ball bearing caster support, to new work locations. Note the drill fixture on the floor above.

A Burgmaster Radial 6-Spindle Drilling Machine greatly simplified the machining operations on a 23' 2" long, 19" wide x 5" deep welded gear rack assembly weighing 2100 lbs. 300 operations including c'drill, drill, c'bore, tap, ream and core drill are performed on both sides, and center locations were maintained by long, easy-to-handle magnesium drill fixtures with slip bushings. One man produces a part in less than 4 hours, including the doweling operations.

The standard Burgmaster Radial Drill with its long sweep and ability to be moved quickly from one hole location to another solved the problem of handling long work pieces inexpensively. Most important, however, lead time to get into production was reduced to a minimum — just the time to make the drill fixtures — 2 days.

JOB FACTS

Company:
American Electric Co.
Paramount, California

Machine:
Burgmaster 2 BR 6-Spindle Radial Turret Drilling Machine

Part:
Gear Rack Assembly; Lot 400

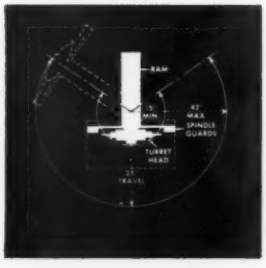
Material:
1020 Steel — Wt. — 2100 lbs.

Holding:
Rests on table and ball bearing caster support. Uses Drill Fixtures with Slip Drill Bushings

Operations:
300 — C'Drilling, Drilling, C'Boring, Tapping, Reaming & Core Drilling

Production:
Less than 4 hours

Advantages:
Goes into production at once, inexpensively handles large work, eliminates requirements for special equipment, occupies minimum floor space.



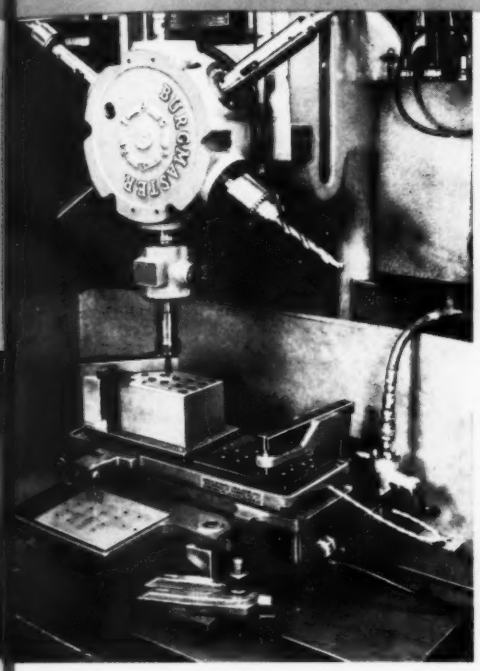
The Burgmaster Radial 6-Spindle Turret Drill has a ¾" drill and tap capacity in steel. The Radial sweeps a radius of 14" minimum to 42" maximum through 250° over a 24" F to B by 36" L to R table. The ram rolls on large double row ball bearings and is easily positioned by one hand from the handle on the turret. Releasing thumb button hydraulically clamps all units rigidly in place.

MODERNAIR USES Burgmaster MODEL 2B

TURRET DRILL AND RAPID POSITIONING TABLE

to save 60% Tooling Costs!

at Modernair Corporation, San Leandro, California



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speeds 85 Drill, Tap and Ream Operations per Part

Modernair now performs 85 operations in a lot of 2024 aluminum valve bodies with a Burgmaster Model 2B, 6-spindle turret drill equipped with a *rapid positioning table*. This Burgmaster combination permitted holding fixture costs to be cut from $266.00 to $90.00, tooling time from 2 weeks to 2 days, and production time savings of 8 hours of labor per valve body. Ream tolerances were held to a ±.0005 with a RMS-18 finish, and hole locations were held to a ±.002. Another reason you should get the facts on Burgmaster.

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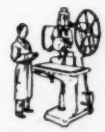
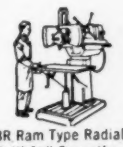
1C Manual Power Index ⅜" Capacity



2B Manual Power Index ¾" Capacity

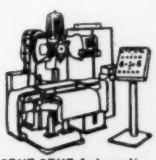


2BR Ram Type Radial Drill ¾" Capacity

2BH Automatic Hydraulic ¾" Capacity

3BH Automatic Hydraulic 1½" Capacity

25AH Automatic Tape Controlled 1¼" Capacity



2BHT-3BHT Automatic Tape Controlled ¾" and 1½" Capacity

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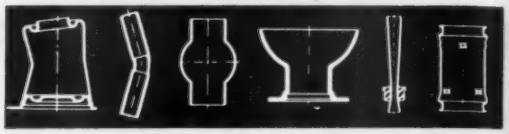

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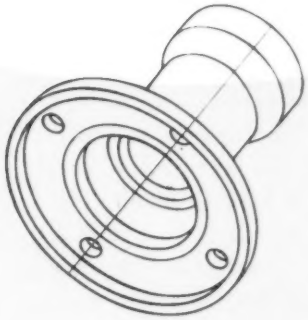

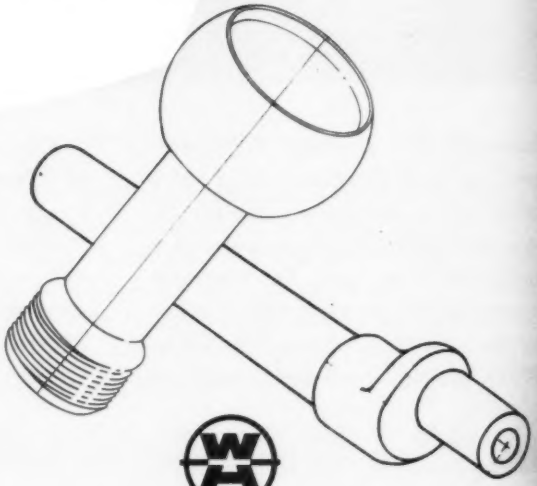

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6	17	30	59	90	664	771	853	893	972	1004	1053
7	18	31	60	91	701	772	871	921	973	1021	1054
8	19	33	65	94	702	773	872	922	974	1022	1061
9	20	34	68	95	703	811	873	923	975	1031	1071
10	21	35	69	99	704	812	881	924	981	1032	1072
11	22	36	71	101	705	813	882	931	982	1033	1073
12	23	37	75	109	721	814	883	932	983	1034	1074

EDITORIAL ITEMS

C1	C10	C19	C28	C37	E1	P1	P10	P19	P28	P37	P46
C2	C11	C20	C29	C38	E2	P2	P11	P20	P29	P38	P47
C3	C12	C21	C30	C39	E3	P3	P12	P21	P30	P39	P48
C4	C13	C22	C31	C40	E4	P4	P13	P22	P31	P40	P49
C5	C14	C23	C32	C41	E5	P5	P14	P23	P32	P41	P50
C6	C15	C24	C33	C42	E6	P6	P15	P24	P33	P42	P51
C7	C16	C25	C34	C43	E7	P7	P16	P25	P34	P43	P52
C8	C17	C26	C35	C44	E8	P8	P17	P26	P35	P44	P53
C9	C18	C27	C36	C45	E9	P9	P18	P27	P36	P45	P54

Which article in this issue interested you most? _____

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6	17	30	59	90	664	771	853	893	972	1004	1053
7	18	31	60	91	701	772	871	921	973	1021	1054
8	19	33	65	94	702	773	872	922	974	1022	1061
9	20	34	68	95	703	811	873	923	975	1031	1071
10	21	35	69	99	704	812	881	924	981	1032	1072
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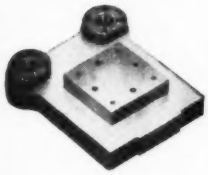
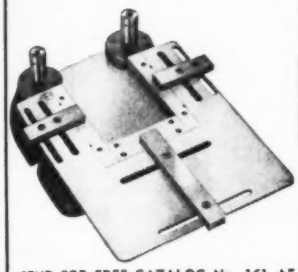


This is another of the many different kinds of punches and dies in stock or made to order for foot, hand or power operation. Precision made from high grade tool steel. Also adaptors and die shoes to convert your press.



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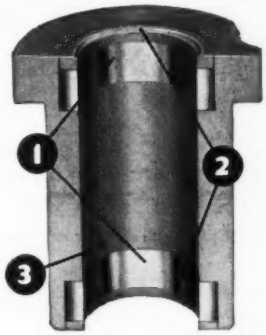

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MEYCO **W. F. MEYERS CO., Inc.**
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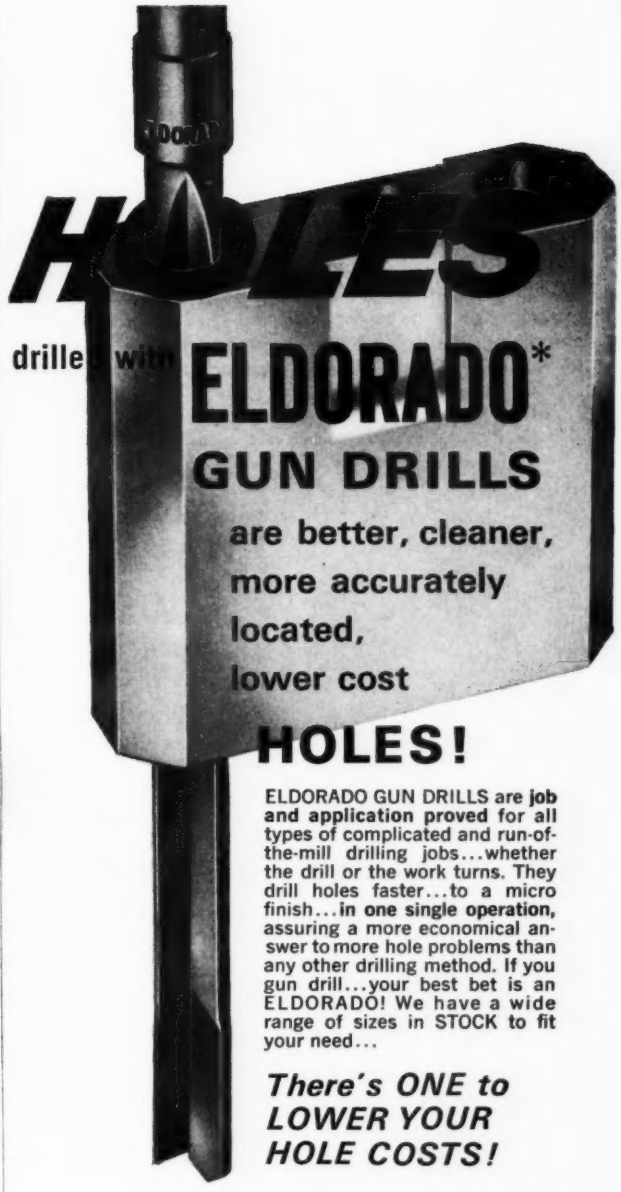

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Also custom made Gun Drills in all dias. up to 2" in any length within dia. limits —ON NORMAL DELIVERY

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CIRCLE INFORM-A-GRAM KEY NO. 773

T&P Catalogs & Literature

A handy slide calculator simplifies computation of tonnage required to shear all commonly used metals. It also determines whether an available shear has sufficient capacity for a given job. The calculator and Bulletin VHS-61 come to you from Verson Allsteel Press Co. on Inform-A-Gram No. C1.

Universal and independent type chucks are described in a new bulletin from Kalamazoo Industries, Inc. Circle Inform-A-Gram No. C2.

High precision radial drills are described and illustrated in new catalog sheets from Boice-Crane Co. Inform-A-Gram No. C3.

OBI presses from Federal Warco Div. McKay Machine Co., are outlined in Bulletin 52113. Inform-A-Gram No. C4.

Ratings, wheel data, and dimensions of AC solenoid operated type S brakes from Cutler-Hammer, Inc. are given in Brochure LJ-75 from the company. Inform-A-Gram No. C5.

Bulletin 222 from Nebel Machine Tool Corp. deals with a new improved micro-turn high speed precision lathe. No. C6.

Lincoln Engineering Co.'s complete line of air compressors for industrial applications is outlined in a new catalog. Circle Inform-A-Gram No. C7.

Burgmaster 6 and 8-spindle tape-controlled turret drilling, tapping, milling, and boring machines are covered in a catalog from Burgmaster Corp. No. C8.

Interested in answers to setting up complete new manufacturing facilities, or revising antiquated production facilities, deciding what to automate for greatest return, and analyzing the investment for an assembly machine? You can get the answers in a brochure from Designers for Industry, Inc. Inform-A-Gram No. C9.

Die tryout presses are cataloged by Alpha Press & Machine Inc. Inform-A-Gram No. C10.

A simplified method to select Flexidyne dry fluid drives and couplings for most industrial applications is featured in a 20-pager from Dodge Mfg. Corp. Bulletin 70 on Inform-A-Gram No. C11.

Electro-hydraulic tracer mills are described and illustrated in a catalog from Famco Machine Co. Inform-A-Gram No. C12.

"Steel Rule Diemaking" is a brochure offered by Acme Steel Rule Die Corp., circle Inform-A-Gram No. C13.

A comprehensive brochure on heads for drilling, reaming, tapping and boring, is available from Zagar, Inc. No. C14.

A 56-pager from The Meaker Co. describes power rectifiers for every AC to DC application including anodizing, electrochemical processing, shop power supplies, etc. Inform-A-Gram No. C15.

Cleaning and polishing small component parts, instruments and control mechanisms.

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Catalogs . . .

Bulletin 200 covers a wide range of salt bath applications including neutral hardening, tempering, carburizing, annealing, high speed quenching and nitriding. Offered by A. F. Holden Co. on Inform-A-Gram No. C16.

Bulletin ESA-323 describes RA Borolon V8 vitrified bonded grinding wheels with man-made rubies as the abrasive. Copies from Simonds Abrasive Co., on Inform-A-Gram No. C17.

Combined drills, countersinks, keyseat cutters, arbor keyseat cutters, cutter reamers, lathe mandrels and machine countersinks are delineated in literature from Keo Cutters, Inc. Inform-A-Gram No. C18.

"Facts about Plastics" lists capabilities of acrylic, Implex, Nylon, Teflon, polyethylene, and phenolic and fibrous glass reinforced polyesters and epoxies. Also included are Mylar, ABS, and acetal. From Cadillac Plastics & Chemical Co. Inform-A-Gram No. C19.

Allen Tool Corp.'s services, including contract machining, machine design and construction, contour machining, mass spectrometer leak testing, welding, production of special equipment and many more are covered in a brochure. Inform-A-Gram No. C20.

"Mech-Spec-News," quarterly publication of Mechanical Specialties Co., outlines the company's precision machining and tooling and the design and production of special-purpose machines and ground support equipment. Inform-A-Gram No. C21.

"Allen Tool Tidings" published by Allen Tool Corp. brings you accounts of transfer machine fixturing with 1000 dimensions held to 0.0002 limit. Other features include bending and fusing. For your copy circle Inform-A-Gram No. C22.

Circling Inform-A-Gram No. C-23 will bring you Bulletin HD-561 on R. K. LeBlond Machine Tool Co.'s NF Design 2516 and 3220 heavy duty engine and tool room lathes.

Driving centers are specified and illustrated in Catalog 50961 from Power Grip, Inc. No. C24.

The Norelco 14MeV (million electron volt) Neutron Generator is the subject of a folder from Philips Electronic Instruments. Inform-A-Gram No. C25.

Tie rod cylinders and hydraulic directional and functional flow valves are the subject of a folder offered by Rivett Lathe & Grinder, Inc. Inform-A-Gram No. C26.

A new two-way solenoid safety shutoff valve for handling heavy fuel oil is diagramed in a bulletin from Automatic Switch Co. Inform-A-Gram No. C27.

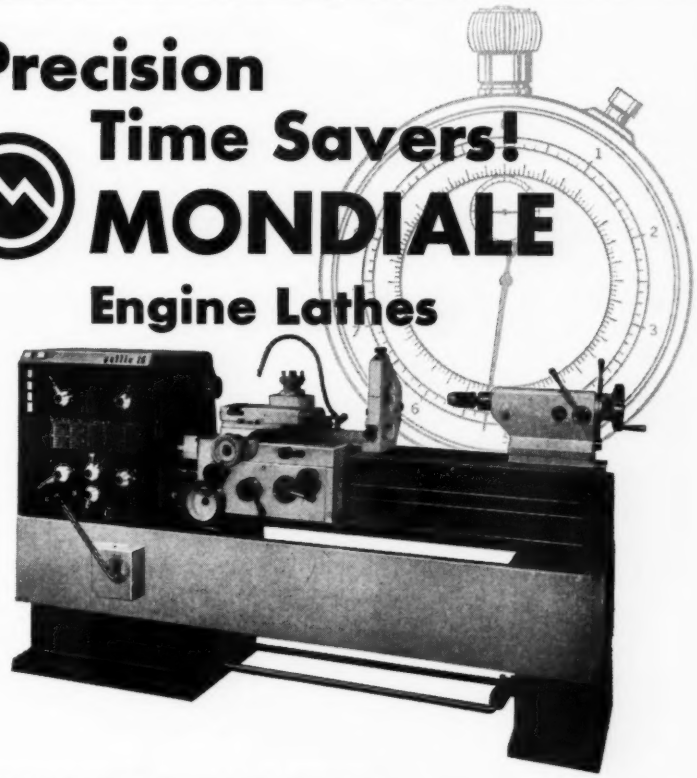
Bulletin 109 from the M. A. Ford Mfg. Co. describes performance, sizes and prices of carbide diamond-grind routers. Also mentioned are solid carbide drills with the new circuit board point. Inform-A-Gram No. C28.

Model ABL-5 and Model SL-3 resistor helixing lathes that can be used for helixing metal, carbon, and oxide films on glass or ceramic resistor banks are the subject of a new catalog from Industrial Instruments, Inc. Inform-A-Gram No. C29.

Precision Time Savers!

MONDIALE

Engine Lathes



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MONDIALE LATHES are manufactured in 5 different models.
MONDIALE LATHES offer:
Ruggedness • economy • functional design • easy operation • standard spindle nose • hardened and ground ways • heavily ribbed bed.

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Gallic #16	16"	—	16	2000	10/7.5
Celtic #12	12"	—	16	2000	3/2
Celtic #14	14"	21¼"	16	1600	3/2
Celtic #17	17"	25"	16	1350	6.5/4
Celtic #20	20"	30"	18	1000	6.5/4

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122 East Second St., Mineola, L. I., N. Y.
CIRCLE INFORM-A-GRAM KEY NO. 79

Catalogs . . .

"Flat Machining Applications Cut Costs . . . Improve your Product" is the title of a brochure from Abrading Systems Co. Inform-A-Gram No. C30.

"Breaking Lubrication Barriers," published by Alpha-Molykote Corp., discusses theory and use of solid lubricant. No. C31.

Bulletin 761 shows chucking, taper pin, Morse and center reamers from Precision Twist Drill & Machine Co. Check No. C32.

V-R micro-adjustable boring bars with throwaway inserts are introduced in Catalog 6105 from Vascaloy-Ramet Corp. No. C33.

Vascojet M-A, a new ultra-high strength steel with tensile strength above 360,000 psi, is outlined in a brochure from Vanadium-Alloys Steel Co. Inform-A-Gram No. C34.

Electrode holders, ground clamps, cable connectors, lugs and splicers and other arc welding machine accessories are covered in Twecolog 13 from Tweco Products, Inc. Inform-A-Gram No. C35.

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that costs you NOTHING!

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All models and accessories described, illustrated in full.

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CIRCLE INFORM-A-GRAM KEY NO. 80

Users of Brown & Sharpe cutting tools will welcome a new guide to all cutting tool literature from the company. Some 30 brochures, booklets, catalogs and article reprints are mentioned. Inform-A-Gram No. C36.

A guide to soluble oil selection and dilution rates for specified machining operations on steels, irons, alloys, aluminum, copper and copper metals is offered by Shell Oil Co. Inform-A-Gram No. C37.

A new differential pressure gage, designed for indicating up to 60 psid in systems up to 3000 psi, is leak-proof and operates on a magnetic coupling. It's described in Bulletin E10 from Pall Corp. Inform-A-Gram No. C38.

Specialized production facilities such as welding, machining, assembly and engineering at Danly Machine Specialties, Inc. are outlined in a brochure from the company. Inform-A-Gram No. C39.

Sintered carbide products and die machinery plus wire puller jaws and inserts, round wire, bar and tube drawing dies, etc. are all mentioned in Catalog FDM-6 from Firth Sterling, Inc. Inform-A-Gram No. C40.

Solid-Cast Everseal to protect motor windings against severe environmental conditions, is described in a new brochure for specifying and design engineers. It is offered by U. S. Electrical Motors, Inc. on Inform-A-Gram No. C41.

A new conversion chart, designed to expedite the ordering of drill jig bushings, has been published by Acme Industrial Co. Inform-A-Gram No. C42.

Features, functions and usage of 15 varied tool and work holding, indexing, and positioning devices and cycle assists are outlined in Catalog G4A from Ex-Cell-O Corp. Inform-A-Gram No. C43.

New Series 4000 Bild-A-Rack, storage racks that require no special tools, extra equipment, or cutting, are outlined in a bulletin from Paltier Corp. No. C44.

Pallseal, new stainless steel and Viton A seal for fluid systems operating at −65° and +500°F and up to 10,000 psi, is the subject of Bulletin E15 from Pall Corp. Inform-A-Gram No. C45.

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DRILLING and TAPPING

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Easy access for quick set-up. Universal, lubricated ball joint spindle provides complete flexibility while maintaining accuracy and alignment. Fast conversion from drilling to tapping on any drill press.

Complete Line-Ettco has the tool for your single or multiple small hole production job.

ETTCO TOOL AND MACHINE CO., Brooklyn 37, N. Y.

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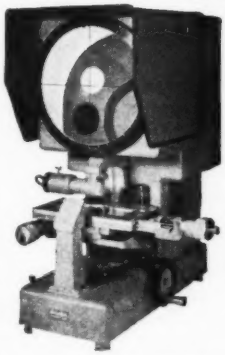
Stocker & Yale's
UNIVERSAL OPTICAL COMPARATOR



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- Large capacity staging area with 7¼" vertical elevation — more than adequate for the majority of work
- Accessories include protractor, stages and fixtures, interchangeable screens, and overlay charts, etc.

CUSTOM OPTICAL PROJECTION METHODS ENGINEERING

In addition to our broad line of standard comparators for precision applications, we probably have custom engineered and manufactured more special-purpose equipment than any other company in the field. What is your problem?

Write for Catalog No. 318A

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CIRCLE INFORM-A-GRAM KEY NO. 812

Prebco Bushing Company

MINIATURE
DRILL BUSHINGS

.0002 tolerance on I.D., O.D. and concentricity	Hole sizes—from .005 O.D.s—from 1/16" Lengths—from 1/8"

COMPLETE STOCK MAINTAINED
SPECIAL MANUFACTURING TO SPECIFICATIONS

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EDgewood 7-0112

PREBCO BUSHING CO.
14714 E. ARROW HIGHWAY
BALDWIN PARK, CALIFORNIA

CIRCLE INFORM-A-GRAM KEY NO. 814

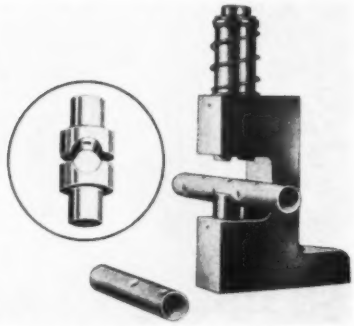
T&P Product News

Direct Reading

Reliant Model B-1400 depth and groove location gages incorporate a special feature for rapid direct reading of groove width. When the gage is applied to the part with foot contacting one surface of groove, a push button slides it to the opposite side of the groove. Width of groove is distance travelled by gaging rod plus thickness of foot. This method simultaneously checks groove location. A large diameter (0.187) gaging rod is standard. Gages feature a 0.0005, 0-25-0 dial indicator, plus one footed and one straight rod to user's choice of dimension. More from Boice Gages, Inc., Hyde Park, N.Y., or Inform-A-Gram No. P1.

Tube Piercing

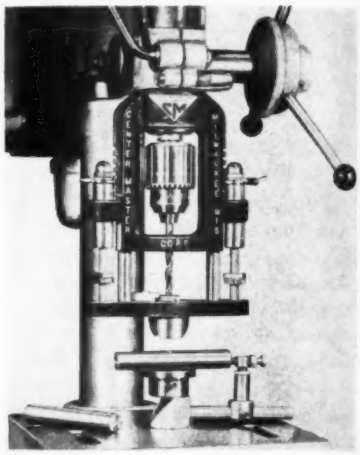
A new improved tube-piercing unit will perforate one hole only, or two opposed holes, with one press stroke. The holes need not be the same diameter or configuration, and no mandrel is needed. Distortion is held to an absolute minimum. Perforating is accomplished by placing tubing in the matching configuration in the unit.



When the press is actuated, ram descends and moves upper half of floating guide downward until it encases tubing. As the ram continues its stroke, punches advance and perforate both top and bottom of tubing. Added information from Tool Products Corp., North Tonawanda, N.Y., or on Inform-A-Gram No. P3.

Drill Press Attachment

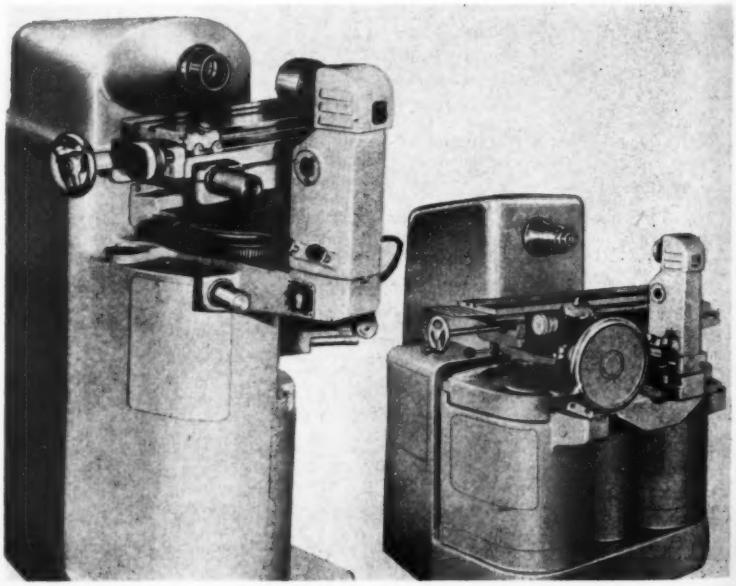
A new "Center Master" drill press attachment provides controlled, uniform operations for drilling, counterboring, chamfering and reaming. The attachment can hold, locate and guide the cutting tool on any round, hexagon or square part. The drill, reamer or counterbore passes down



through a bell bushing or vee bushing depending on type of work. A 100 lb spring pressure on push rods holds work securely. Along with standard drilling operations, the unit can be set up for burr or nib cut-off, off-center drilling and special drilling with vee bushings. Write Portage Double Quick, Inc., 1046 Sweitzer Ave., Akron 11, Ohio. No. P4.

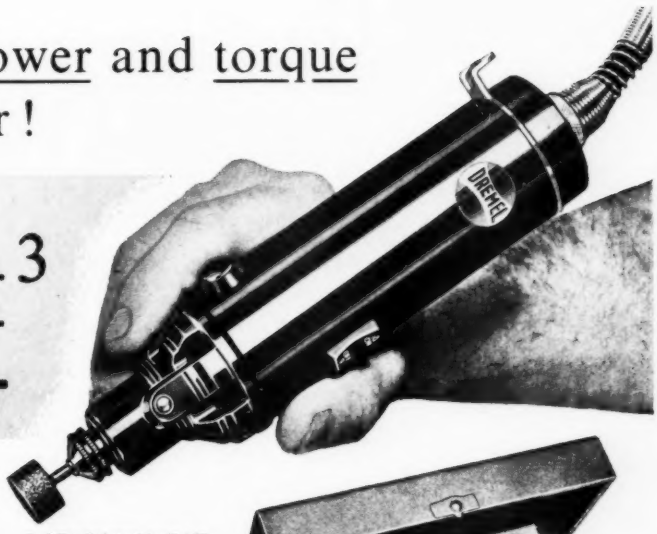
Comparators

Large area lenses and generous machine capacity are combined in two direct projection comparators. The units measure and inspect hob and milling cutters, templates, contour turned parts, etc. Model DPC with single column support measures 4″ vertically, and 5 to 8″ horizontally depending on worktable selection. Model DPC-ER has double column support and measures 8″ vertically and 10″ horizontally. Both models give coverage up to 60″ screen size at all magnifications. More from Jones & Lamson Machine Co., Springfield, Vt., or Inform-A-Gram No. P2.



New standard for power and torque in a compact grinder!

NEW DREMEL NO. 3 INDUSTRIAL MOTO-TOOL



Breakthrough in small grinder design! New Dremel No. 3 is a compact "powerhouse" — operates at 27,000 rpm, sustains high torque under load. And it weighs only 17 oz.! Its light weight gives positive, sensitive control for close tolerance work . . . means non-tiring operation — even for women operators. Just the versatile tool you need to handle a wide range of industrial jobs including polishing, grinding of dies and molds, patternmaking, industrial model building, production deburring, general tool room use. The No. 3 has a 110 V AC or DC motor with a high velocity fan for cool-running operation. Has heavy-duty, shockproof bakelite housing.

Order From Your Supplier or Write for Industrial Bulletin

No. 3 Moto-Tool complete with 1/8" and 3/32" collets, 3-wire grounding cord with 2-prong adapter and finger grip in steel storage case. **Only $29.95.**

No. 2 Moto-Tool — long time favorite with industry, craftsmen, model makers since 1936 —

No. 2 Moto-Tool with 3-wire grounding cord. **Only $19.95.**

No. 2 Moto-Tool with 23 accessories in steel case. **Only $29.95.**

DREMEL MFG. CO., Dept. 521-L, Racine, Wisconsin

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CIRCLE INFORM-A-GRAM KEY NO. 831

NEW! HANDY ADJUSTABLE RISER BLOCKS

U. S. PAT. 2-785-963

for FASTER—SAFER—CHEAPER SETUPS

Use on Drill Presses—Milling Machines—Punch Presses—Surface Grinders—Planers, etc. End lost time looking for right height odds and ends.

HANDY RISER BLOCKS

- Give heights from ⅜" to 2⅜" in ⅛" increments.
- Cut setup time by eliminating haphazard blocking.
- Cost only $7.50 per pair; $75.00 per 12 pairs, plus transportation costs. Shipping weight 3 lbs. 10 oz. per pair.

ORDER TODAY. USE THIS COUPON.

HANDY PRODUCTS
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Gentlemen: Please ship ..... pairs of RISER BLOCKS.
Company .....
By ..... Title .....
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Open account shipments to rated companies. Otherwise, payment with order, please. No C.O.D.'s. Ohio customers add 3% sales tax.

AIR-MITE AIR CYLINDERS

★COMPACT ★POWERFUL ★RUGGED ★LOW COST

AIR-MITE Cylinders—made in Single or Double Acting Series, in 4 mounting types, are high quality cylinders at a low price. Simple, rugged design and compact construction give them long life, permit easy mounting on jigs, fixtures, tools, or machines. Used wherever power holding, pushing, pulling, or lifting is required, AIR-MITE Cylinders will meet your most exacting requirements of dependability and long life. Write for complete catalog and prices.

QUALITY FEATURES:

1. Ground and polished steel ram
2. Bronze oilless ram bushing
3. High strength aluminum alloy cylinder heads
4. Brass, true-bore cylinders
5. Five steel tie rods

92

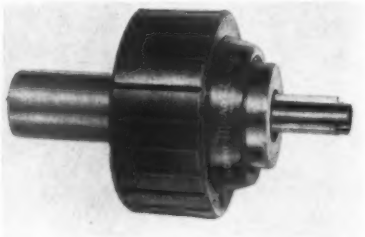
AIR-MITE DEVICES, INC.
4405 W. Kinzie St., Chicago 24, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 832

Product News

ID Chucks

New Micro-Grip ID chucks with repeatable accuracy of 0.0002 TIR, feature interchangeable jaws, shoulder stop, and hardened and ground tool steel construction. They come with 3 or 6 jaws. The chucks attach to lathes, millers, grinders, etc. via collet, chuck or

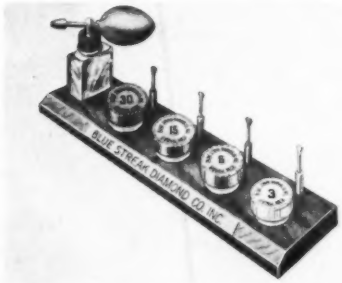


face plate. They can also be used as mandrels and held between centers. Five sizes with ID's from ⅜ to 3½", by means of interchangeable jaws, are offered by LeCount Tool Works, Inc., P. O. Box 252, Cheshire, Conn. Write, or check Inform-A-Gram No. P5.

Electronic Gages

New, completely transistorized electronic gages that measure physical dimensions as small as two millionths (0.000002) are offered by Techni-Rite Electronics, Inc., 61 Centerville Rd., Warwick, R.I. Featured is the Minicom System of interchangeable precision measuring units. This includes amplifiers, height gages, bench comparators, dice thickness gages, and the Minigage head. These lightweight units are available in both 110 v AC or self-contained battery models. Other units are the Surfmaster, Delcom Metrology Comparator, Pulcom Cylindrical grinder control, and the micro-checker. P7.

Diamond Compound Board



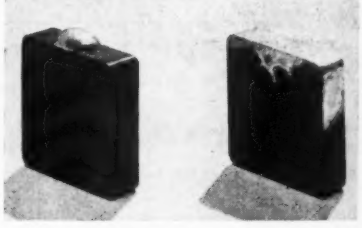
A "kolor keyed" diamond abrasive compound board comes free with every purchase of 5 gram jars of the compound from Blue Streak Diamond Co., Inc., 36855 Schoolcraft Rd., Livonia, Mich. The new compound contains virgin diamond particles that are laboratory size-controlled. Compounds come in standard micron and mesh sizes, are uniform and positively identified by color and number. The compound is ready-mixed and packaged in tubes, disposable syringes, small or large cartridges or jars to suit the users' needs. Inform-A-Gram No. P6.

Independent Programmer

Time consuming and expensive dimensioning of coordinate positions and preparing special templates or master boards are all outdated with a new independent programmer. The unit prepares conventional 1" wide 8 channel tapes for drilling printed circuit boards directly from art. The programmer can be used with any

conventional tape controlled printed circuit driller. It allows locating up to 30 positions/min. The unit covers an area of 24 x 24" and handles virtually all grid sizes with the use of interchangeable slides arranged for 0.1, 0.5, or 0.025 grids and art scales of 1:1, 2:1, and 4:1. More from Edlund Machinery Co., Dept P, Cortland, N.Y., or Inform-A-Gram No. P8.

Unibraze Process



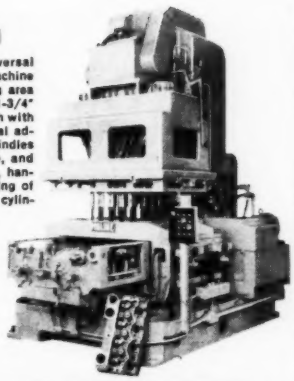
Unibraze is a new patented carbide additive. It provides thoroughly clean and ready to use carbide blanks. Grinding, sandblasting or chemical cleaning is not necessary. According to Unimet Carbides, 435 West Ontario St., Chicago 10, Ill., the process improves braze strength up to 30%, lowers working temperatures by 200 to 500°F and thus reduces possible heat damage to carbide and steel. Unibraze is available on all Unimet blanks and is said to be particularly effective on the titanium grades. More from the makers, or on No. P9.

HD13

straight line drilling machine with hydraulic table feed and 18 spindles each having 11/16" diameter drill capacity in mild steel. Spindle center distances are adjustable along the 6-foot machine rail.

MODEL HU111

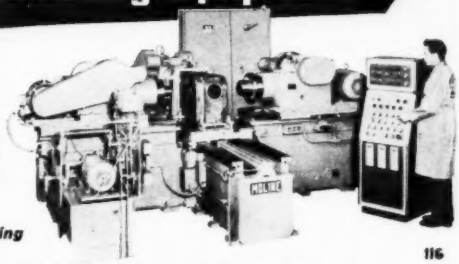
Hydraulic Feed, Universal Joint-Type Drilling Machine with 24" x 50" drilling area and with forty-two 1-3/4" spindle drivers, each with two-speed and neutral adjustment. Thirty-six spindles in slip spindle plate, and power shifting fixture, handle drilling and reaming of three different engine cylinder heads.



MOLINE Cost Reducing Equipment

MODEL MR148

Three-way, three-spindle, horizontal boring machine with selective automatic feed cycle. Handles boring of cylinder and crank bore for 3 sizes of 1-cylinder blocks. Also bores for wet sleeves in 2- and 3-cylinder blocks.



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18"
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42"
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Number of stations to suit your requirements

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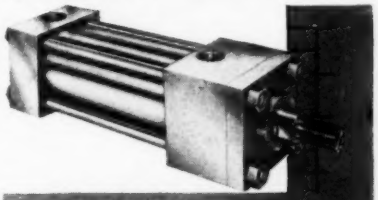
CIRCLE INFORM-A-GRAM KEY NO. 852

NEW O-M SQUARE-HEAD AIR AND HYDRAULIC CYLINDERS

GIVE THE PERFORMANCE YOU EXPECT... AND MORE



Air—(rated 200 psi)
Hydraulic—(rated up to 2000 psi)
Meet JIC Standards 1 ½" to 14" Bores

Long Service
Uniform Performance
Dimensional Interchangeability
High Operational Efficiency
Compact — Saves Space
Quick, Easy Maintenance

Made of the highest quality materials and seals, these new components combine modern design, the latest and best engineering advancements with O-M specialized "know how" and precision workmanship.

New Series "K" Air Cylinders

Construction features include brass cylinder barrel, chrome-plated, high tensile steel piston rod with a minimum yield strength of 90,000 to 100,000 psi. Rolled and machined steel heads and extra long cartridge-type rod bearing assure perfect alignment of piston rod.

New Series "L" Hydraulic Cylinders

Similar in many construction features to Series "K", but specifically designed for hydraulic service. Incorporate vee-type rod packing and a cylinder barrel of micro-honed steel tubing which are best suited for hydraulic operations.

With the addition of the new Series "K" and "L" to the Ortman-Miller major line of air and hydraulic cylinders, you can now rely on O-M for *all* of your low and medium pressure cylinder requirements.

Mail coupon today for complete details. All cylinders in Bulletins 115A and 116 have been dimensioned in accordance with NFPA recommendations for your convenience.

ORTMAN-MILLER MACHINE COMPANY
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☐ Have representative call
Please send Bulletin(s)
☐ 115A—Series "K" ☐ 116—Series "L"

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POSITION_____
COMPANY_____
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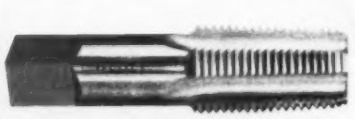
CIRCLE INFORM-A-GRAM KEY NO. 853

Product News

Minimizing Stop Lines

Due to changes in flute geometry and special cam grinding of the thread form, new Taper pipe taps will thread most metals with absolutely minimized stop lines. According to Besly-Welles Corp., South Beloit, Ill., the new Taper



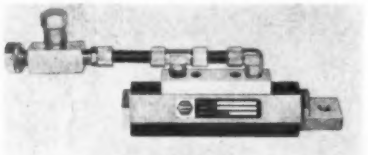
pipe taps are said to produce accurate threads that assure pressure-tight joints for critical fitting installations. Write the manufacturer, or check Inform-A-Gram No. P10.

Boosters

New Power-Lok boosters permit high-pressure hydraulic operation from ordinary shop air pressures. Two series, BA and BD with capacities of 150 psi air or oil to 5000 psi hydraulic are available. Bore sizes range from 1½ to 14". Special boosters up to 20,000 psi for a variety of fluids are also available. The new boosters come in a variety of mounting styles from Milwaukee Cylinder Co., Cudahy, Wis. Inform-A-Gram No. P11.

Exhaust Manifolds

Series EM Vibrajust exhaust manifolds allow attaching of needle valves, air mufflers, hose adapters, and dustproofers to the exhaust ports of all Vibrajust vibrators. The exhaust manifolds are available for Vibrajust attaching



head vibrators, flange mounted vibrators and midget ones, also foundry vibrators and others of bore size ½ to 3". More from the Branford Co., 130 Glen St., New Britain, Conn. No. P12.

Compensating Driver Chuck

A positive drive device is said to completely eliminate tap slippage with a new model '09 tap chuck from Erickson Tool Co., 34350 Solon Rd., Solon, Ohio. The driver consists of a slotted bar that is free to shift within the body of the tap chuck. Set screws at each end of the slotted bar grip the square shank of the tap in the slot. Concentricity is within 0.0005 TIR. The '09 chuck comes in three sizes: E09 for taps from 0 to ¼", F09 with a range from 0 to ⅞", and G09 from ½ to 1½". More from the maker, or Inform-A-Gram No. P13.

End Mills

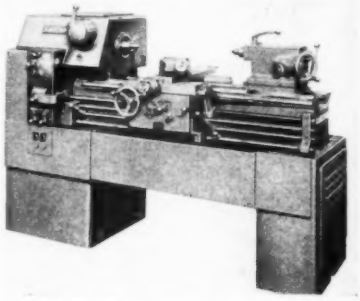
Gold Label End Mills come in standard sizes from 1/16 to 2". The HSS end mills include all popular styles such as 2, 3, 4, 6 and 8 flutes, single and double end, short, long and extra long flute lengths. Shell end mills, ball end mills, and corner rounding end mills are also included in this new line from Quality Tool Works, 322 S. Elmwood Ave., Waukegan, Ill. Inform-A-Gram No. P14.

Commercial Locknut

Lokon, a new prevailing torque locknut made of heat treated alloy steel, is said to give high strength without bulk. Other advantages cited are Class 3B threads, temperature resistance to 550°F, conformity with military specifications, tensile strength exceeding 250,000 psi, and a built-in flange that saves washer cost. Allen Manufacturing Co., Hartford, Conn., offers the nut in sizes from #10 through ½", UN and UNF threads. More from the makers, or on No. P15.

Dual Drive Lathe

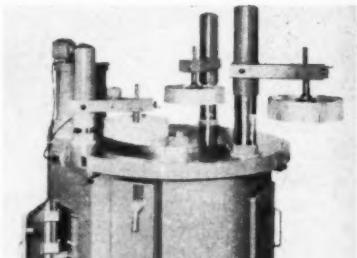
A new 5-hp dual drive tool and diemaker's lathe is built to strict toolroom tolerances. It's sturdy enough to maintain them. It has apron reverse to leadscrew, single-lever selection of 16 speeds from 31 to 2400 rpm and built-in hp meter. The dual drive headstock



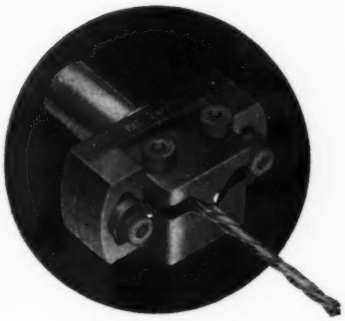
provides 12 gear driven spindle speeds and 4 belt-driven ones for the high range. There are 48 feed and thread changes available through the totally-enclosed quick change box. R. K. LeBlond Machine Tool Co., Madison at Edwards Rd., Cincinnati 8, Ohio offers Bulletin 7, or circle Inform-A-Gram No. P16.

Flat Lapping Machine

Gyro-Matic a new 36" flat lapping machine comes in both pneumatic lift and conventional models. The pneumatic lift model can obtain optical flatness to 1 light band (0.0000116.) The unit laps and/or finishes piece parts directly from turning, milling, and sanding operations. It handles steel, cast iron,



bronze, carbides, quartz, ceramics, etc. There's a 36" anti-distortion lapping plate, a new dry fluid drive that prevents shocks, and a 3 point bearing contact between steel and workholder conditioning ring. Spitfire Tool & Machine Co., 2931 N. Pulaski Rd., Chicago 41, Ill. offers added data. Inform-A-Gram No. P17.



in half the time

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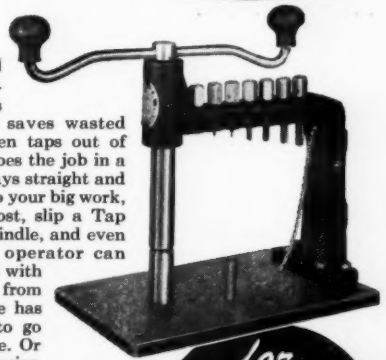
TAP BREAKAGE Reduced



The DAHLSTROM TAP GUIDE practically eliminates tap breakage and saves wasted hours getting broken taps out of expensive dies. It does the job in a jiffy with work always straight and true. Carry it over to your big work, or fasten it to a post, slip a Tap Adaptor into the spindle, and even an inexperienced operator can handle it. Equipped with 9 adaptors, ranging from 8-32 to ¾". Spindle has center in top end to go in tail stock of lathe. Or use it as a tap extension for hard-to-get-at-places.

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HARDNESS TESTING
has been done with the SCLEROSCOPE
Since 1907

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Magnetic Base Tool Holder

21 MAGNETIC TOOLS

11 Permanent Magnets—Various Sizes and Types

Indicator Holder — ½" dia. non-magnetic stainless steel rod complete with 5/16" and ⅜" O.D. bushings. Fine precision adjustment identical to surface gage. Hardened ball socket setting permits universal positioning. Powerful 50-lb. pull magnetic base insures firm grip on any ferrous surfaces curved or flat.

Model 200B—$6.95

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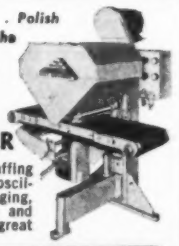
Grind . . . Grain . . . Polish . . . Buff . . . on the

TRI-MATIC Oscillating BELT GRINDER



Rigidity permits buffing pressures, controlled oscillation, fast belt changing, wet or dry operation and other features provide great versatility.

TRI-MATIC DIVISION
Sales Service Mfg. Co.
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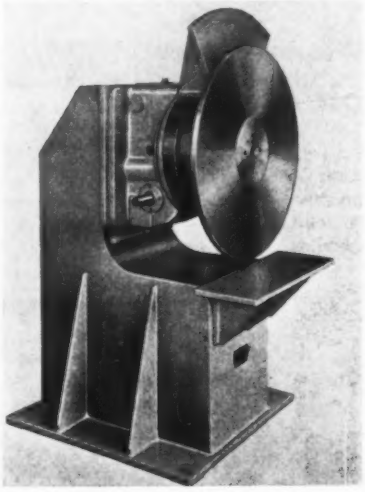
CIRCLE INFORM-A-GRAM KEY NO. 885

Product News

Turret Indexing Chassis

A new vertical turret chassis is suitable for assembling, processing or testing operations requiring positive mechanically actuated intermittent motion in a vertical plane. The chassis, a modification of the standard Series B, is available with 20, 30, or 40″ turret. It



employs a hardened tool steel crossover indexing cam that provides a cycloidal displacement cam path. The chassis has an electric clutch brake, limit switch, and timing cam for cycle control and tooling interlock. For engineering specs write Swanson-Erie Corp., 814 E. Eight St., Erie, Pa., or P18.

Little Squirt

A new air-powered transfer pump called Little Squirt will pump up to 7 gal/min free flow. It handles fluids up to 80 weight gear oil easily, according to Aro Equipment Corp., Industrial Div., Bryan, Ohio. The unit is said to transfer almost any kind of non-corrosive fluids, including oils, gear oils, water, kerosene, gasoline, antifreeze, thinners and solvents. Delivery is instantly adjustable from zero to full flow. Air power needed is as little as 15 psi or standard line pressure up to 150 psi. More from the manufacturer, or on No. P19.

Load Cell

A new load cell, designed for extremely precise control of machine tools and materials handling processes, is actuated by deflections as small as 0.001 to 0.005. Force Control Cell is useful for detection and control of roll pressure, punch press forces, die wear, dull drills, sheet thickness, press fit forces, welding electrode pressures etc. The compact 4″ high unit is available in 16 standard models with capacities from 500—1000 to 75,000—500,000 lbs. The units can sustain overloads up to four times their rated capacity. Standard cells feature one knob control. Cells may be supplied with two control knobs for high-low or go-no-go control. More from Force Controls Co., 424 W. 8 Mile Rd., Ferndale, Mich. Inform-A-Gram No. P20.

Fill and Wipe

A new machine automatically finishes dials, emblems, and various piece parts, wherein first or second surface depressions are to be filled and then wiped and polished. A rotary index table can be equipped to accommodate any combination (up to five) of interchangeable accessory heads, a fill head, a smear wipe, a full wipe, a light buff, and a painting head. Conforming Matrix Corp., 814 New York Ave., Toledo 11, Ohio offers particulars. Or circle No. P21.

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Lepel induction heating equipment is the most practical and efficient source of heat developed for numerous industrial applications

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Frequencies: 400 Kc to 900 Kc
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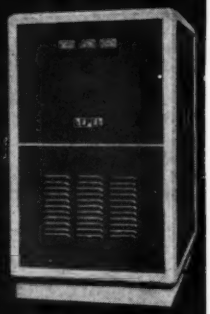

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CIRCLE INFORM-A-GRAM KEY NO. 891

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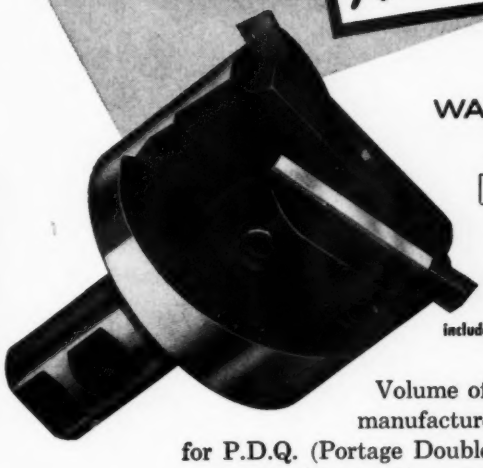

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M-25, 2½" Dia. cutter
includes 2, ¼" wide carbide inserts

Volume of sales and economy in manufacture have made it possible for P.D.Q. (Portage Double Quick) to reduce the cost of Milling Cutters. In addition to the model shown, reductions were also possible in 5" and 3½" Dia. tools. Carbide inserts prices have been reduced too!

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PDQ **PORTAGE Double-Quick, Inc.**
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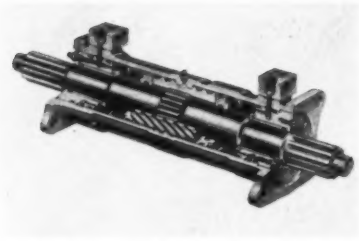
CIRCLE INFORM-A-GRAM KEY NO. 893

Product News

Hydraulic Actuators



A group of new rotary actuators can be used to steer, dump, lift, open, close, transfer, position, rotate, index and hold. The units offer angular rotation to 200°. They operate on pressures up to 5000 psi and require a low flow of hydraulic fluid. Rotary torque output ranges from zero to 500,000 in-lbs. The actuators have no internal by-pass leakage. They will not back-off under sustained loads, vibration or shock, according to Menasco Mfg. Co., Burbank, Calif. Inform-A-Gram No. P22.

NEW! NEW! NEW! NEW! NEW!

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PUNCHES and DIES

FROM STOCK . . . LOW COST . . . HIGH PERFORMANCE—All the red tape and high inquiry cost is eliminated when you order carbide punches and dies from Oberg's Standard Pricing Sheet. The standard punch or die you need is shipped right from stock . . . no delays! . . . and the price per unit is low!

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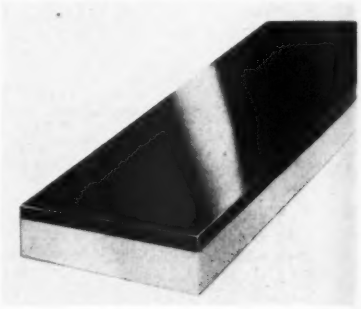
(A Division of Oberg Manufacturing Co., Inc.)

Send today for New Carbide Standard Punch and Die PRICE LIST effective June 26, 1961

CIRCLE INFORM-A-GRAM KEY NO. 90

Liners and Wear Plates

New bronze liners and wear plates for diemaking are useful as slides in cam and trim dies, and as guides and heels in flanging and draw dies, according to Ohio Knife Co., Dept. LL, Cincinnati 23, Ohio. The aluminum bronze has Bhn of 230 to 250. These wear



plates also have great tensile strength, and are finish ground to 0.0005 parallel and flat. They can be drilled and counterbored through the bronze surface. The soft steel backs are easily machined to suit the die. Inform-A-Gram No. P23.

Boring Bars

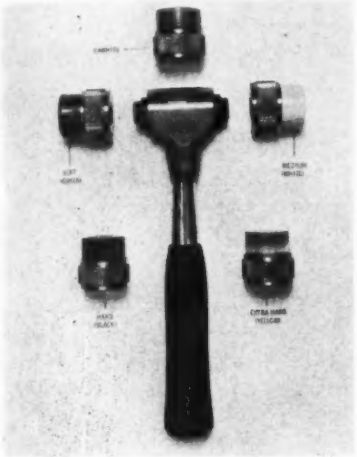
Semi-finished boring bars, called K-bars, are credited with reducing chatter and minimizing deflection, according to Kennametal, Inc., Latrobe, Pa. Tool-holding steel heads, brazed to the shanks, are large enough to accommodate any tooling that would be used on each size of bar. Available tooling

includes the new Kendex adjustable units and tooling of other manufacturers. Mountings may be machined by the user, by Kennametal, or by other tool manufacturers. K-bars come in ten sizes from 7/16 to 2½" bar diameter and from 7⅜ to 28¼" in overall length. Write, or circle No. P24.

Product News

Multi-Faced Hammer

A new hammer is so versatile it runs the gamut from sledge power to precision sensitivity. The Shure-Drive can be fitted with five interchangeable and replaceable tips of varying degrees of hardness. The unit has a floating head, said to be the most important development in almost 100



yrs of hammer manufacture, to reduce rebound by 40%. A steel striker, much like a solid cylinder within a tube, floats within the head. Write Olin Mathieson Chemical Corp., Ramset Fasteners, New Haven, Conn., or use Inform-A-Gram No. P25.

Bantam Size Regulator

Banti-Reg Model 2017 is a very small new pressure regulator. It has a gage port. Its sister Model 2018 has no gage port and costs less. Banti-Reg is all brass with a neoprene diaphragm. It is a mere 2¼" high and 1 7/16" wide. Both models have ¼" NPT inlet and outlet, but ⅛" NPT connections are available. Primary pressures up to 400 psi can be regulated to the range of 5 to 125 psi secondary pressures. The unit delivers up to 80 cfm at 100 psi with 200 psi inlet pressure, for example plus or minus 1%. Maximum operating temperature is 200°F. More from Wilkerson Corp., 1640 W. Mansfield, Englewood, Colo., or Inform-A-Gram No. P26.

Chamfering and Countersinking

A multi-flute chamfersink and a mono-flute countersink are new from Dixie Tool Industries, Inc., Bridgeport, Mich. The chamfersink is designed for chamfering and light countersinking of most materials, including ferrous and non-ferrous ones. The Dixie mono-flute countersink works on most metals including the very tough and highly abrasive exotic ones. It's said to give longer tool life

and produce a smooth, chatter-free seat. Both units come in standard 60, 82, and 90° included angles. Added information from the makers, or on No. P27.

REDUCE MANUAL HANDLING OF PARTS TO A MINIMUM

SYNTRON Transfer & Storage

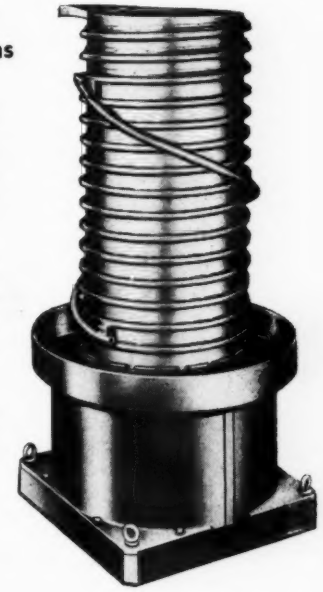
PARTS FEEDERS

Relieve production lag between primary and secondary operations

Syntron Transfer & Storage Parts Feeders are designed to receive parts at one level, store prior to usage and discharge in an oriented position at another level. They provide an automatic, instantly adjustable method of distributing parts from one process operation to another; eliminating slow, manual parts handling.

The powerful electromagnetic drive unit produces 3600 instantly controllable vibrations per minute. Simplicity of design means dependability of operation, longer service life, and lower maintenance.

If you have an operation to operation parts handling problem, Syntron Transfer & Storage Parts Feeders will help reduce costs and speed production.



Call your Syntron Representative or write for a Syntron Parts Feeder Catalog Section.

61PF4

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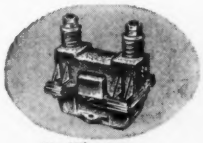
Lapping Machines

Battery Chargers



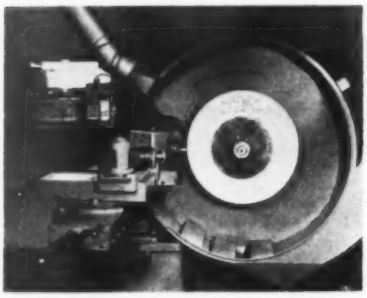
Bin Vibrators

CIRCLE INFORM-A-GRAM KEY NO. 91

Product News

Dyna-Grader

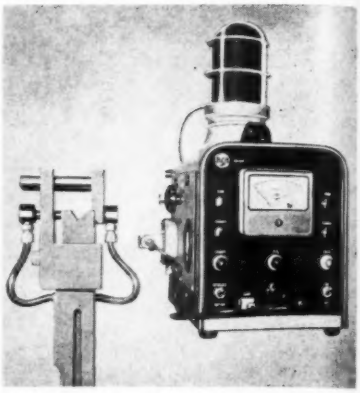
This electronic device tests hardness and uniformity of a grinding wheel across its entire cutting face while the wheel is rotating. Test results, electronically recorded on a permanent tape, will help users improve quality control of their



production grinding. The testing device passes a conical steel cutter across the face of the moving wheel and crushes minute amounts of abrasive from the wheel surface. Forces required to crush the abrasive are electronically measured. The system is currently in use at Macklin Co., Jackson, Mich. Write, or check Inform-A-Gram No. P28.

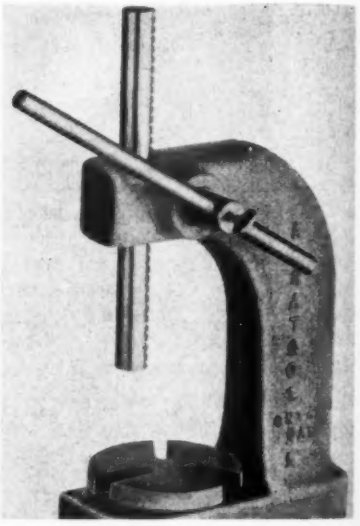
Gage for Centerless Grinders

A new automatic post-process gage for centerless grinders consists of an electronic limit signalling comparator, and a gaging station fixture with twin air jets on a vee block. A green light flashes as acceptable parts are gaged. Since limits can be set well within the allowable tolerances, the operator can make grinder corrections before actual rejects are produced. The comparator itself can be located on top of the grinder or on some other nearby support. For more information contact Radio Corp. of America, Industrial and Automation Div., 12605 Arnold Ave., Detroit 39, Mich., or check Inform-A-Gram No. P29.



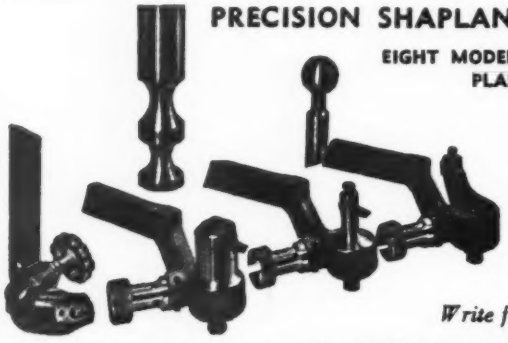
Hand Arbor Press

A new hand-operated arbor press with 5¼″ inside height and 2½″ working throat depth is designed for riveting, seating bearings and bushings, and wire cutting in electronic, miniature and subminiature work. The unit has a ⅝″ dia arbor concentric with a 1″ hole in the base. It's supplied with four 13/64″ base mounting holes, weighs 14 lbs and is available from Acratool, Inc., 1114 E. Emporia, Ontario, Calif. Inform-A-Gram No. P30.



PRECISION SHAPLANE RADIUS TOOLS

EIGHT MODELS FOR LATHES, SHAPERS, PLANERS AND BORING MILLS



Range: ⅛″ to 3″ for concave radii on lathes. Two sizes for convex radii (Balls up to 2½″ dia.) on lathes. Also heavy duty model for radii to 6″ on planers, etc.

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Patent Pending

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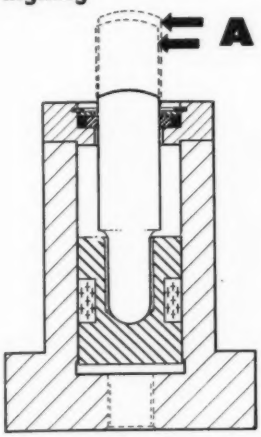
MASS PRODUCED IN STOCK SIZES FOR INVENTORY, SO THAT HIGH QUALITY CAN BE MAINTAINED AT LOW COST, FOR SAME-DAY SHIPMENT.

DELTRONIC 924 Bonn Street, Costa Mesa, California

CIRCLE INFORM-A-GRAM KEY NO. 924

Product News

Self-Aligning



A new hydraulic die cylinder, Hyson SA (self-aligning), features a ball joint contact between the piston and the piston rod. A "floating" guide ring replaces the conventional piston rod bearing. This holds the piston rod central during installation. Although the floating guide ring has served its mechanical purpose after installation, it prevents dirt from entering the cylinder. According to Precision Products, Inc., 8811 Maywood Ave., Cleveland 2, Ohio, the new design improves service life without leakage, scoring or maintenance. These cylinders may ultimately serve during the entire operating life of the average die. Inform-A-Gram No. P31.

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Chromelloy quickly hardens any steel, even cold rolled, by a carburizing, nitriding and alloying effect. Mild steel tools or parts, Chromelloy treated, will outlast by several times same items made of tool steel and hardened in usual way. Easy and safe to use—no cyanide. Used over ten years by largest plants.

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MICRO MINIATURES®

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1/32" thru 3/16" in 1/64" INCREMENTS

2, 3, & 4 Flutes
Flat & Ball Ends
Single & Double Ends
1/8" or 3/16" Shanks

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Also in Stock:
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For { 8-STATION PRODUCTION MACHINING
1½" BAR AND COLLET WORK
CHUCKING
SINGLE POINT THREADING

Costs { $7,525.00 FOB Factory Complete with all standard equipment

This is an all new 1½" bar capacity ram type turret lathe with power feeds to all 8 working stations . . . that in addition to bar and collet work also has the versatility to do chucking, and when needed, single point threading. Powered by a 5 h.p., two-speed, geared motor, the new Sheldon 3 R turret lathe provides 16 spindle speeds, 60 different feeds to the carriage and cross-slide, and 180 different feeds to the ram turret.
The turret itself is ruggedly built and accurately machined to provide close tolerance indexing. And for complete ease of operation, it is put under power by simply pressing a push button on the control panel.

This new 3 R Sheldon is completely equipped with two-speed motor and electrical controls, coolant system and splash guards, LO spindle nose, large satin chrome dials and hardened bed ways. It also provides an additional cost saving feature—each turret face is drilled and tapped for your standard flange type tooling as well as being bored for your standard 1½" shank type tooling.
For versatile, accurate machining in either long or short runs, the new Sheldon 3 R provides the answer to low investment cost with high profit operation.

New SHELDON 3R-TURRET LATHE

Write for bulletin with complete specifications and tooling data

SHELDON MACHINE CO., INC.
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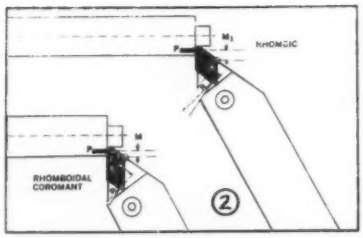
Builders of 10", 11", 13", 15" Sheldon lathes, Sheldon Milling Machines, Sheldon Shapers and Sebastian Geared Head Lathes

CIRCLE INFORM-A-GRAM KEY NO. 935

Product News

Copying Tool

Coromant T-Max tracer tool incorporates an angle-locking feature and a rhomboidal shaped insert. The latter is said to permit 40% greater depth of cut and better support. When properly equated, the Coromant rhomboidal insert in its holder has 2.23 times greater resistance to turning forces (turning moment) than the



conventional rhombic (diamond) insert in its holder. Further information is available from Sandvik Steel, Inc., Fair Lawn, N.J., or on Inform-A-Gram No. P33.

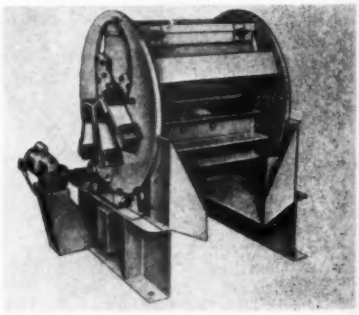
Indexing Unit

A new pre-engineered indexing unit adapts to cycle precision conveyors, transfer chassis and dial indexing machines. The unit's cam and roller components provide trapezoid acceleration for smooth and shockless indexing. The hardened, ground cams index accurately within 0.001 on a 12″ dia sprocket or dial. Torque range is

25,000 in/lbs. Indexing periods are available in 90, 120, 180, and 270° permitting selective cycle timing of index and dwell. A double-extended input cam-shaft allows synchronization with tooling actuators and cam-switching interlocks. More from Visi-Trol Engineering Co., 12720 Burt Rd., Detroit 23, Mich., or No. P34.

Barrel Finishing

New design, increased capacity, and pushbutton operation characterize a new vibratory barrel finishing machine, Model VB-6. The 6 cu ft unit deburrs, deflashes, polishes, or descales. It has a pushbutton feature for rinsing or unloading. It completely finishes



parts, rotates to the emptying position and tilts the barrel all automatically. The electromagnetic drive produces 3600 vibrations/min. The unit finishes both heavy and light gage metal, odd stampings, shielded areas and recesses. For added information, write Syntron Co., Homer City, Pa., or Inform-A-Gram No. P35.

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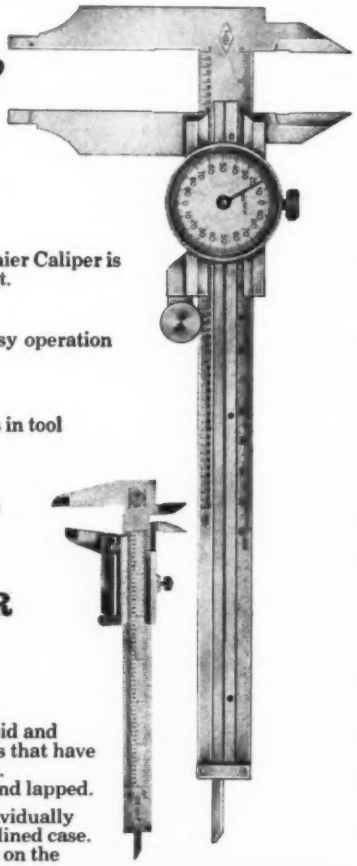
DIAL VERNIER CALIPER with built-in DIAL INDICATOR
Direct Reading in .001"



The world famous "HELIOS" Dial Vernier Caliper is hardened, ground and lapped throughout.

Other features:

- Thumb roll permits quick and easy operation
- Knurled lock screw
- 100% measuring capacity (outside, inside and depth.)

Available in 5", 6", 8" and 10" capacities in tool steel or stainless steel.

Height Gage Attachment optional.

"HELIOS"
SWING-JAW VERNIER CALIPER
with knurled lock screw

- Direct Reading
- Capacity 4¾"
- Length of Jaw 1⅝"

The swinging jaw allows a very easy, rapid and extremely accurate measurement of parts that have faces which do not lie along the same axis. This caliper is stainless steel, hardened and lapped.

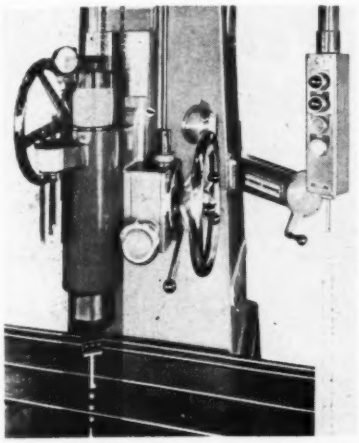
Every "HELIOS" Vernier Caliper is individually packaged in a beautiful hardwood velvet-lined case. Write for detailed information and prices on the "HELIOS" Caliper line.

M. B. I. EXPORT & IMPORT LTD.
MBI
475 Grand Concourse, Bronx 51, N. Y.

Product News

Hole Borer

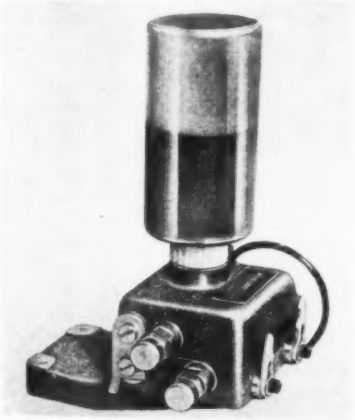
A new machine tool is capable of ultra-precision boring, yet is has a simple positioning method.



For additional information on this precision hole borer, write the Canton Tool Mfg. Co., East Canton, Ohio for their descriptive brochure. Or mark Inform-A-Gram No. P36.

Controlled Oiling

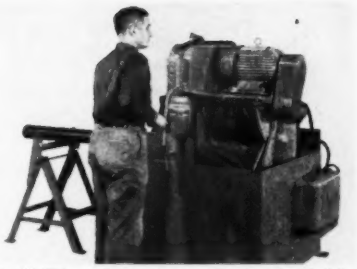
A new oiler deposits a controlled film of cutting oil on top and bottom surfaces of coiled stock before it enters the punch press dies. Oil is fed to the core of a pair of rollers and the flow is controlled to each roller by adjustable needle



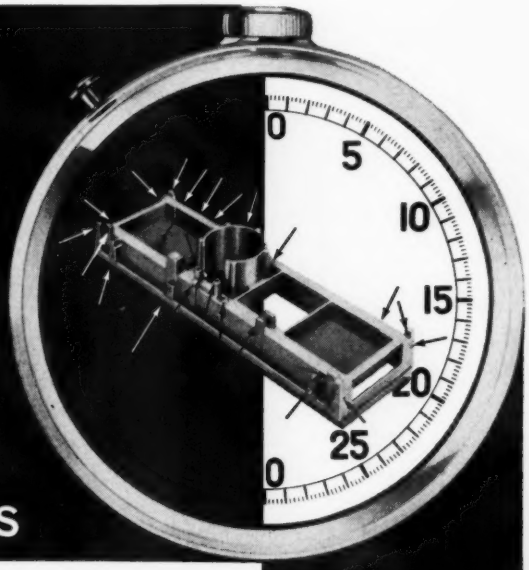
valves. The oiler maintains a uniform film of cutting oil and handles coiled stock up to 3″ wide and 1/16″ thick. Oil supply is held in a plastic bottle, opposed to open reservoir, which eliminates excess lubrication or spilling. More from Jaco Devices, Inc., 96 High St., Hingham, Mass. No. P37.

Abrasive Cutting

Model 102-A Cutamatic abrasive cutting machine cuts solids up to 4″ square, pipe and tubing up to 6⅝″ OD, angle iron up to 6 x 6″, channels up to 8″, and flat stock up to 6 x 1″. It cuts most metals at a rate of 3 to 4 sec/sq in. Oscillating action is said to assure more cuts per wheel. A stationary wheel guard gives operator protection. A variety of workholders and work support stands are available according to Allison-Campbell Div., American Chain & Cable Co., Inc., 929 Connecticut Ave., Bridgeport 2, Conn. Inform-A-Gram No. P38.



25 HOLES 5 SIDES 30 SECONDS



ON THE WIS-MATIC 5-WAY MACHINE

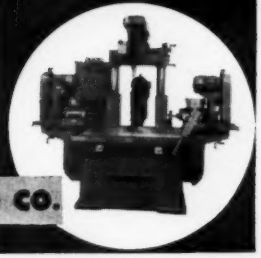
In ONE work-cycle (30 seconds from floor to floor), holes are drilled, countersunk and spot faced to exacting tolerances on 5 sides of a 6-sided, highly irregular work-piece by this versatile, adaptable, 5-Way Drilling and Tapping Machine equipped with Package Tooling and Wisconsin Drill Heads. Here is what it does at the push of a button in this particular application:

- Top Unit drills 5 holes
- Left Unit drills 7 holes
- Back Unit drills 2 holes
- Front Unit drills 2 holes
- Right Unit drills 9 holes

Write for illustrated Bulletin No. 560.

WISCONSIN DRILL HEAD CO.
4975 N. 124th STREET • BUTLER, WIS.

WIS-MATIC can solve your HOLE PROBLEMS just as efficiently, cut your hole processing time just as drastically.



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WHY DON'T **YOU** MAKE THIS CONFIDENT MOVE?

Strengthen your company, your employees, your country. Contribute to a stronger America! A thriftier and more secure company family. How? By installing the Treasury's Payroll Savings Plan for the automatic employee purchase of U.S. Savings Bonds. If you already have the plan, promote it now. Encourage higher employee participation.

Remember—everybody benefits from payroll savings. Your employees, your company, your community and your country. It not only encourages thrift and patriotism, but provides vital reserve buying power in your own community.

The State Director of the U. S. Savings Bonds Division will be glad to help. Call on him for specific ideas that work or write to: Treasury Department, U. S. Savings Bonds Division, Washington 25, D. C.

* * *

Note to the Company Treasurer: Did you know that "E" and "H" Savings Bonds can be purchased by your company, too? A fine way to invest surplus funds.

Promote the Payroll Savings Plan for

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. . . and Underwrite your Country's Might!

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Improve Acme Tapping with Single Pass Acme Taps. Eliminate Shaved Threads, Improve Finish, Reduce Machining Time.

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DEEP HOLES IN ONE PASS!
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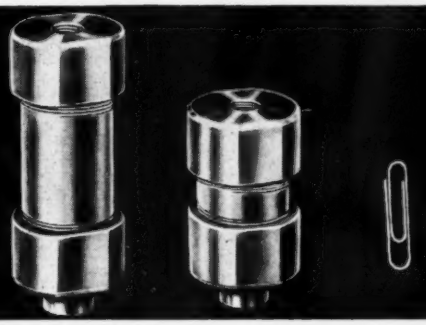
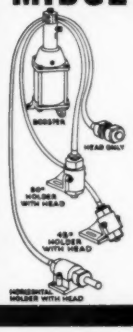
BIG GRIP FOR TIGHT PLACES!



with Wilton's NEW
MIDGET air-hydraulic PowRlock!



Holding problem in a machine operation where clearances are critical? The new Midget PowRlock is your answer. Although the Midget is smaller than a pack of cigarettes, it develops holding forces up to 1900 pounds! Securely holds and positions regular or irregular pieces. Four 1" or eight ½" stroke heads may be operated from a single booster.

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WILTON TOOL MFG. CO. INC. / SCHILLER PARK, ILL.
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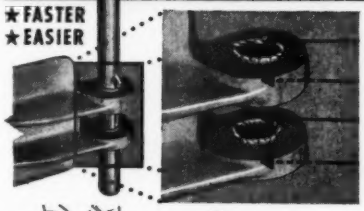
CIRCLE INFORM-A-GRAM KEY NO. 974

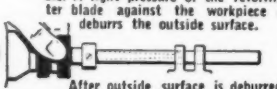
HOW TO.... DEBURR THESE INACCESSIBLE HOLE FACES BY MACHINE OPERATION with the amazing NOBUR TOOL

★FASTER
★EASIER

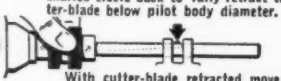


No more hand finishing methods for those hard-to-get-at inner surfaces on multi-wall parts. The NOBUR Tool with its double edge cutting blade does the job in seconds . . . all by **machine operation.** Can be used by anyone, with complete safety, on your own lathe, drill press, etc. Simple to operate.

1. Insert NOBUR tool in any machine spindle. A light pressure of the revolving cutter blade against the workpiece quickly deburrs the outside surface.



2. After outside surface is deburred, slide knurled sleeve back to fully retract the cutter-blade below pilot body diameter.



3. With cutter-blade retracted move workpiece or tool to position for deburring inside surface. Raise cutter-blade to deburr first one surface then the other.

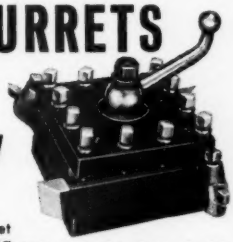
Write for FREE Folder
Send for all details on Nobur Tool Products TODAY!

N-11

NO/BUR TOOLS **NOBUR** MANUFACTURING CO.
6860 Farmdale Ave., No. Hollywood, California
CIRCLE INFORM-A-GRAM KEY NO. 973

Enco TOOL POST TURRETS ±.0005"

Re-Indexing Accuracy Guaranteed!



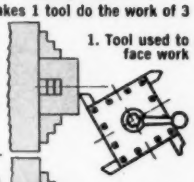
Put an Enco Turret on your lathe and get the accuracy, speed, and cost-cutting advantages that make Enco Turrets first choice of leading lathe builders. Get 12 station indexing—30°, 60°, and 90° from each of 4 tools . . . get smooth, effortless hand indexing . . . and capitalize on the advantages of Enco's exclusive, patented "O" Ring Seal that keeps indexing mechanism free of chips and dirt. There's an Enco Turret made to fit your lathe.

TOOL SIZE	TOOL BLOCK SPECIFICATIONS	PRICES F.O.B. CHICAGO
	(STANDARD)	
¼"- ⅜"	2½" sq. x 1¼" thick	$ 39.00
⅜"- ½"	3½" sq. x 1¾" thick	$ 61.00
½"- ⅝"	3½" sq. x 2¼" thick	$ 76.00
⅝"- ¾"	4½" sq. x 2¾" thick	$ 83.00
¾"-1"	4½" sq. x 2¾" thick	$102.00
⅞"-1¼"	6" sq. x 3¼" thick	$175.00
	(HEAVY-DUTY)	
¾"-1"	4½" sq. x 3" thick	$155.00
1" -1½"	6½" sq. x 3¾" thick	$225.00
1¼"-1¾"	7" sq. x 4¼" thick	$265.00
1½"-2"	7½" sq. x 4¾" thick	$305.00

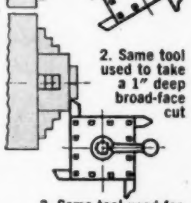
Machineable Base T-Slot Turrets carried in stock.
To order Turret fitted to your lathe, send T-Slot, center height dimensions and maximum tool size. No charge for fitting. Fast Delivery.

Makes 1 tool do the work of 3

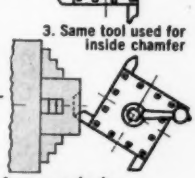
1. Tool used to face work



2. Same tool used to take a 1" deep broad-face cut



3. Same tool used for inside chamfer



Write for catalog #61 and name of nearest dealer
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Your plant produces dust in a surprising number of locations. By collecting it at the source you:

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Hammond Duskolectors don't cost—they pay!

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Fine tools that encourage Good Work

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An ARMSTRONG Wrench feels right—is balanced. It goes over nuts or screw heads easily, grips firmly without sloppiness, won't round corners—because openings are carefully machined to correct sizes. It's safe, strong beyond need without clumsy bulk—because of superior design and selected steels, heat treated to proper degree of hardness and tensile strength. It's quality finished, ARMALOY (alloy steel) Wrenches in chrome plate with heads buffed; HI-TEN (carbon steel) Wrenches in baked-on gray enamel with heads ground bright . . . all plainly marked for size. All are uniformly excellent tools manufactured under strict quality control, by modern methods, with modern equipment in a modern tool plant . . . 1537 different industrial sizes and types—single wrenches, or sets in metal cases, boxes or rolls . . . each a quality tool. Armstrong Wrenches are "Fine tools that encourage good work."

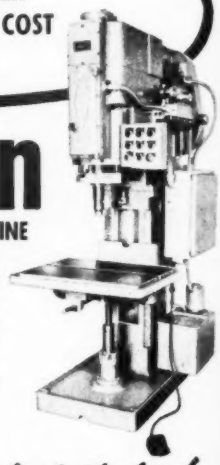
ARMSTRONG BROS. TOOL CO. 270 N. ARMSTRONG ST. CHICAGO 46, U.S.A.

CIRCLE INFORM-A-GRAM KEY NO. 982

on any tapping job . . .
MORE PRODUCTION PER HOUR means LOWER COST for YOU with a

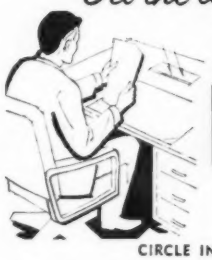
kaufman

MODEL 10E-20 TAPPING MACHINE



More and more manufacturers are learning this fact from hour after hour, day after day, precision production tapping on the Kaufman 10E-20. With higher production, lower product cost, increased sales in mind—you, too, should learn all about the Kaufman 10E-20.

Get the complete facts today!



Write, wire or phone for complete information on the precision tapping machine — the Kaufman 10E-20.

kaufman MFG. CO.

PRECISION MACHINES FOR TOP PRODUCTION

529 S. 29th St., Manitowoc, Wisconsin

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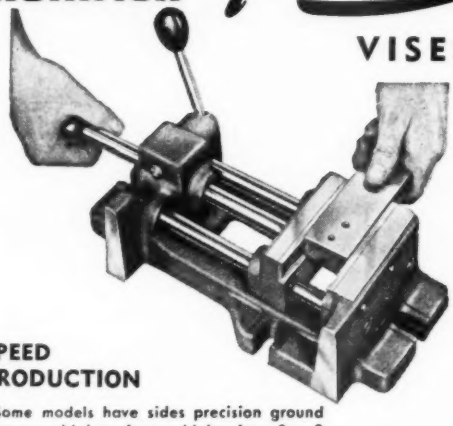
heinrich Grip-Master VISES



SPEED PRODUCTION

Some models have sides precision ground square with jaws for machining from 2 or 3 sides. Jaw widths 3", 4", 6" and 8" . . . from 3" to 9" openings.

CUT TOOLING COSTS UP TO 75%

Use the HEINRICH Grip-Master Jig and Fixture Base. Simply add false jaws and bushing plate.

Result . . . an accurate, low-cost Drill Jig.

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HEINRICH TOOLS, INC., DEPT. 131-L

Racine, Wisconsin

CIRCLE INFORM-A-GRAM KEY NO. 984

Product News

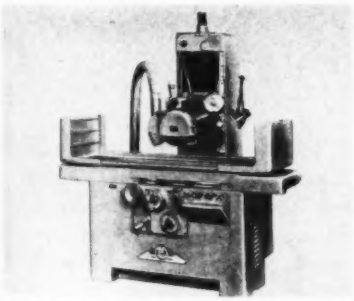
Micro-Sure

A new large-size dial indicator (Micro-Sure MSE 1/2K) with 2500:1 magnification and 0.000050 graduations, has a 3¼" dia dial and provides accuracy over the full AGD range of 0.010. Calibration accuracy is within 0.000050; repetitive accuracy within 0.000005. A

new design enables the indicator movement to follow plunger motion, which provides positive protection against shock in either direction, according to Federal Products, Corp., Providence, R.I. Inform-A-Gram No. P39.

Surface Grinders

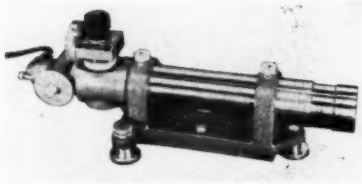
Alina Corp., 122 East Second St., Mineola, L.I., N.Y., recently introduced ELB high precision surface grinders to the U. S .market. The grinders are available in 35 models in size ranges from 6 x 12 x 7¾" to 59 x 197 x 39½".



Wide cross feeds of up to 2⅜" per table stroke are said to increase output. The units have fully automatic work cycle and are simple to operate. Inform-A-Gram No. P40.

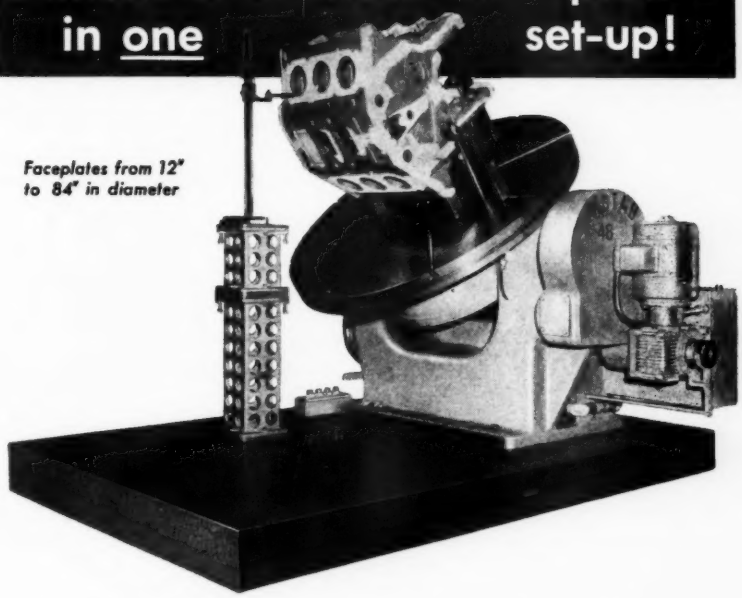
Auto-Collimator

TA-51 Microptic Auto-Collimator establishes squareness, parallelism, flatness, and angles. It's recommended for circular spacing, surface plate testing and machine tool aligning. The unit permits direct reading of horizontal and vertical planes simultaneously to 0.1 sec over a range of 10 min of arc. Interchangeable illuminator and micrometer units allow for straight or right angle viewing. A large



objective lens allows for working distances to 100 ft. More from Engis Equipment Co., Div. of Engineering & Scientific Instrumentation, 431 So. Dearborn St., Chicago 5, Ill., or on No. P41.

Dimensional check on 7 planes in one set-up!



Up to 50% savings in time and manpower

Every angle, diameter, line, critical surface on 7 V-block planes is completely checked without disturbing the initial set-up. Previously a two-man operation . . . now, with motor-powered, push-button tilting and rotation offered by the ROTAB precision positioning table, one man quickly, accurately runs the entire inspection in about half the time. This is how ROTAB is paying off for a major diesel engine manufacturer . . . ROTAB will pay off for you, too. Write for details.

MP MACHINE PRODUCTS CORPORATION
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WHY PAY MORE?

DOUBLE ACTING AIR CYLINDERS

ALLENAIR quality at 'hard-to-beat' prices!

ACD—110
1⅛" Bore
x 1" Stroke

$5.75

- Oilite front rod bearings
- Universal Mounting
- Ground and polished stainless steel rods
- Ratio of force to air pressure 1 to 1
- Available with 1⅛" bore; strokes ranging from 1" to 4"

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Torque Wrench Adapter Calculator Slide Rule

Free

Instantly calculates scale conversion factors for adapters of different lever lengths—set it and read it.

Provides automatic selection of proper torque wrench for adapters and/or proper adapters to go with given torque wrenches.

Sent free upon request, compliments of

PA STURTEVANT CO.
ADDISON QUALITY ILLINOIS

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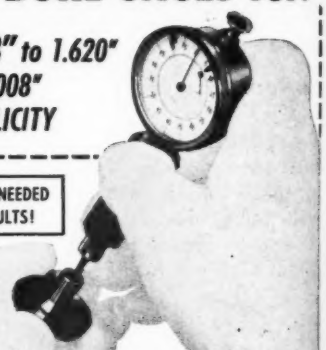
DiaTest BORE GAGES for:

DIAMETERS: .038" to 1.620"
ACCURACY to .00008"
OPERATING SIMPLICITY

NO SPECIAL TRAINING NEEDED TO GET PERFECT RESULTS!



Production Stand, Right-Angle Attachment, Extension Rods, Depth Adjuster and Special Measuring Heads are available for special applications.

DiaTest WILL INCREASE your accuracy and save you time and money in measuring all bores within its range; perfect for out-of-round, tapers, incomplete bores and all other variations.

WRITE TODAY or call (Area Code 312) 631-8888 for complete information!

FOSTER SUPPLIES CO.

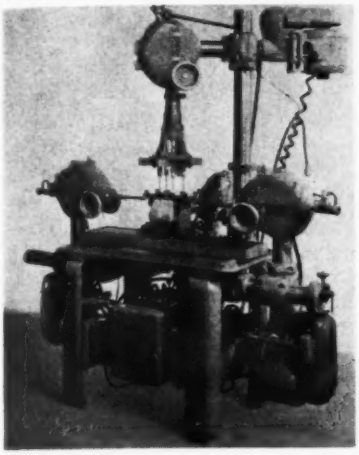
6122 Milwaukee Ave., Dept. TP, Chicago 46, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 1004

Product News

Multi-Head Drill

A new multi-spindle machine can simultaneously drill, counter bore, tap and ream a workpiece from almost any angle. Versi-Matic drill has heads that revolve 360° horizontally and vertically either on or under the work table.



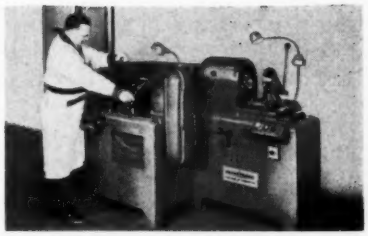
The unit is equivalent in size and power to a conventional 17 to 20" drill press, but performs as a special purpose machine for continuous runs. Each individually powered head can be operated automatically or manually. Versi-Matic accepts all standard drill attachments, including a multi-drill head. Van Norman Machine Co., 3640 Main St., Springfield 7, Mass., or Inform-A-Gram No. P42.

Bushed Idlers

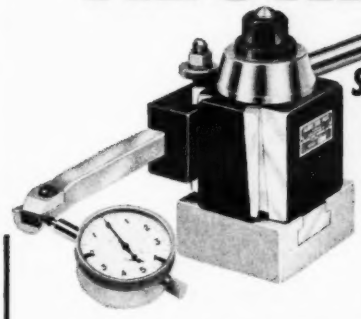
Bronze bushed vee pulley idlers are offered in four sizes for single groove A and B section vee belts. They are made of cast iron and feature a 1" bore. Also in the new line of idlers are 14 sizes of flange flat pulleys and sprockets. Brewer Machine & Gear Co., 1441-43 N. Second St., St. Louis 6, Mo. offers particulars. Inform-A-Gram No. P43.

Tube Flaring

A high-precision production machine is said to accurately and uniformly trim, square, chamfer, and flare standard aluminum, mild steel, stainless steel, brass, bronze, copper and exotic metal tubing. The unit is designed for use on standard tubes with ⅜ to 1½" OD and 0.028 to 0.049 wall thicknesses. Station one of the two-station operation trims and squares the tube end, chamfers both ID and OD. Station two flares the tube accurately and uniformly within commercial tolerances. Progressive Welder and Machine Co., 915 Oakland Ave., Pontiac, Mich. offers added information. No. P44.



ALORIS



Super Precision quick-change Tool Post and Tool Holders

.0001" REPEATING ACCURACY

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"no lathe owner can afford to be without it"

Aloris leads the way with advanced developments in "quick-change" tooling . . . recommended by America's leading lathe manufacturers.

- Modernize your lathe operations for maximum efficiency.
- .0001" repeating accuracy maintained even when deep boring.
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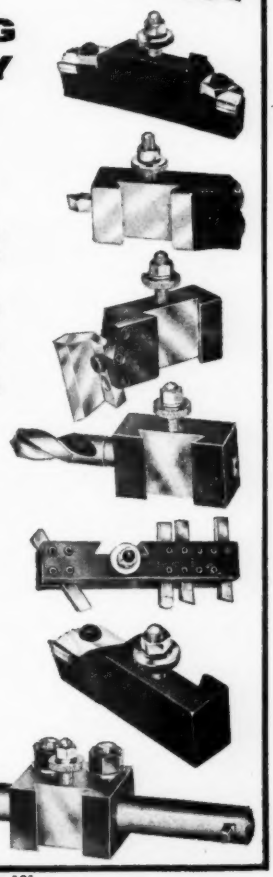

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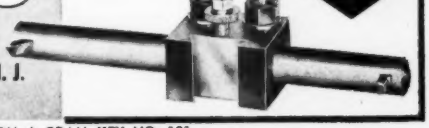

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Measures the exact BORE or blind hole size!
Reading .0001" Size: 3/16" to 4"

Takes accurate measurements of blind holes. No master — measures directly—by .0001". Automatic alignment, rectangular contact points guarantee extreme accuracy even when fully extended. Immediately detects out of round holes; with extensions measures holes up to 30" deep. Hardened contact points exert minimum pressure — will not damage fragile work.

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WRITE FOR CATALOG on complete line of precision measuring instruments: VERNIER CALIPERS, MICROMETERS, DIAL INDICATORS.

ALINA CORPORATION
122 East Second St., Mineola. L. I., N. Y.
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IMMEDIATE DELIVERY OF CONTOUR CUTTERS
For Standard Hydraulic Fittings... *In Stock*

AND 10050 Port Cutters

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Economy Series: Carbide Tipped, integral end pilot

Versatile Series: Carbide Tipped, interchangeable end. pilot and. reamer

High Speed Steel Series: Integral end pilot, Super H.S.S.

"MS" Port Cutters

External Flat Form Tools

MS 33514: Carbide Tipped integral end pilot

MS 16142 "SAE": Carbide Tipped interchangeable end pilot and reamer

MS 33656 E and G; MS 33657E and S Stocked in Carbide Tip and H.S.S.

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Wetmore stocks the fullest line of Port Contour Cutters and Flat Form Tools for Standard Hydraulic Fittings to assure fast delivery. Where required, modification of standard contours can usually be made within 48 hours.

For Special Cutting Tools, Wetmore offers the finest design and manufacturing facilities backed with extensive experience to combine operations and also to machine "problem parts."

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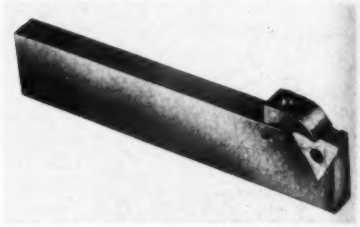
Boring Tools | Reamers | Core Drills | End Mills Routers | Port Contour Cutters | Form Cutters | Milling Cutters | Special Cutters

CIRCLE INFORM-A-GRAM KEY NO. 1022

Product News

For Grooving

Now throwaway tooling can groove near shoulders or machine chucks and face and undercut shoulders. The inserts may be side-mounted for these applications.



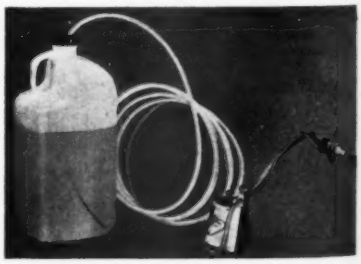
The new Groovall tooling was created in response to a definite demand from industry. U.S. Tool & Cutter Co., 28975 Orchard Lake Rd., Franklin, Mich. offers Brochure G11LX61. Or circle Inform-A-Gram No. P45.

Air Control Valve

A new ⅛" four-way air control valve is bleeder poppet operated. It is machined from solid aluminum and has teflon slides, which makes lubrication unnecessary. The valve is recommended for double acting cylinders up to 2" dia. Write Novi-Matic Valve Div., Novi Tool & Machine Co., 25806 Novi Rd., Novi, Mich., or check Inform-A-Gram No. P46.

Mist Cooling

"Mist" cooling supplies the coolant in an atomized form. It's said to increase die, cutter, drill and tap service life as much as 500% according to Ash & Co., 5100 Grand River, Detroit 8, Mich. The company offers a free application analysis for present machines, or any one might plan to buy. Write, or circle Inform-A-Gram No. P47.



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Drill press vises, angle vises, swivel machine vises, rotary tables, lathe milling attachments, production vises, heavy duty angle vises, and adjustable angle plates are illustrated and fully described in the New Palmgren Catalog. This is the only complete line of work holding devices available anywhere. Designed for production, tooling, and maintenance work, there are 68 different models and types to choose from. Vise jaw sizes are from 1½" to 8". Ask for your copy of this FREE Catalog No. 205 today. The complete line with details and prices are shown.

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ANNOUNCING

THE HOLOMATIC **COMPACT**

SIZE "J"
AIR AND HYDRAULIC POWERED FEED UNITS

- Built-In Versatility
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- Adjustable Rapid Travel Distance
- Adjustable Stroke Length
- Adjustable Feed Rate
- Wide Work Range (1/64 to 3/8" drill and No. 0 to 7/16" tap in mild steel)

3 Models...3 Power-Feed Styles

The new Holomatic family of "compacts" . . . the Size "J", are self-contained, reciprocating quill type power-feed units for use on production drilling, reaming, facing, tapping, threading operations. Used individually or in groups with manual or automatic cycling. Available in 3 "compact" models with 3 power-feed styles with built-in cycle and movement control systems to meet every conceivable need more efficiently and economically.

Write Today . . . for in-plant demonstration . . . or additional information, specifications and low, low prices on the new series "J" units.

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MACHINES, INC.
MONTPELIER, OHIO

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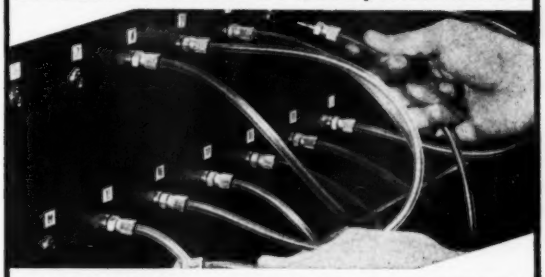
PSC **FLUSH MOUNT QUICK DISCONNECT**

SIMPLICITY & FLEXIBILITY *of a telephone switchboard*



MAKE OR CHANGE set-ups in seconds. To connect, **just push.** To disconnect, **just pull.** No turning or twisting.

A **miniature quick coupling** for flush mounting. Designed for test set-ups, panel boards, bulk heads, etc. Can be flush mounted on panel boards from ¼" to 1" thick.

SOCKET AND PLUG have tube supports for ¼" O.D. plastic or rubber tubing. Easy finger tight connections.

Automatic locking forms a positive, leak-proof connection. Integral check valve stops the flow when lines are disconnected. Ideal for instrument & test set-ups.

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Elevating Table

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PRICE F.O.B. CHICAGO **$245.00**
Special engineered models available.

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Mark II Standard Model

- 750 lb. capacity
- Lift 54" from 4½"
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Write for complete engineering details. Dealers in all principal cities.

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PRICE
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SINCE 1901 Headquarters for Die Handling Equipment and Hi-Reach Overhead servicing machines
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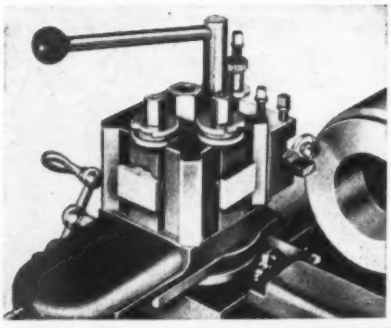

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CIRCLE INFORM-A-GRAM KEY NO. 1042

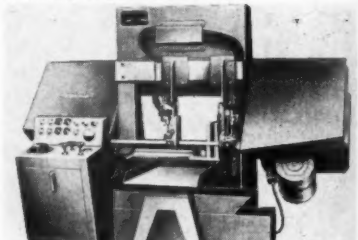
Product News

Thread Roller

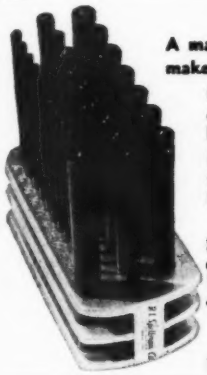
Model 75A planetary thread rolling machine can be set up fast, and thread rolls screws and nails at 400 pc/min, according to Prutton Corp., 5305 W. 130th St., Cleveland 30, Ohio. The machine handles overall blank lengths up

to 3″ and ¼″ dia. Rapid adjusting feed track, expanding die mandrel for trueing die, and a small thin-wall ring die that sets up in 10 min to perfect concentricity are a few of the unit's special features. Write, or mark No. P48.

Metal Band Saws



Two new horizontal metal cutting band saws are introduced by W. F. Wells & Sons, Inc., Three Rivers, Mich. Model Q-14 has a 14 x 18″, and QJ-24 a 24 x 24″ capacity. Speeds can be dialed in by the operator in a range from 40 to 400 fpm. Ball bearing carbide blade guides require no standby set or setting gages. Quick action vise changes effortlessly for up to 450 angle cuts. More from the manufacturer, or on No. P49.



SPELLMACO SPOTTERS

A matched set of transfer punches for toolmakers, machinists and tool cribs.

Used for transferring location of threaded, drilled and reamed holes, slugs, blanks, etc.

Precision made of finest tool steel carefully heat treated and tempered for long life. .0025 undersize to facilitate use—black oxide finish.

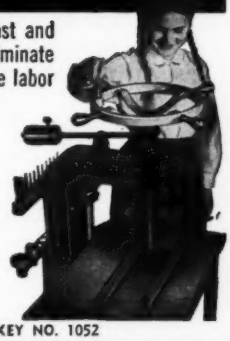
Set No. 3-17: 28 punches with indexed stand — sizes 3/32" to ½" by 1/64" plus handy 17/32" size—length 4⅞". PRICE only $19.40

Single sizes available.

R. L. SPELLMAN CO. • Urbana, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 1051

LASSY TAPPERS . . .



Lassy Tappers make tapping easy, fast and simple. Exclusive patented features eliminate guess work, drastically reduce labor costs, save taps.

3 SIZES.

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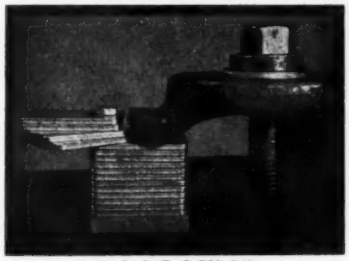

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Use on Drill Presses—Milling Machines—Punch Presses—Surface Grinders—Planers, etc. End lost time looking for right height odds and ends.

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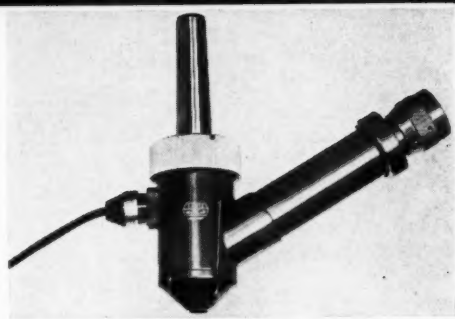
JIG BORER MICROSCOPE



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- for locating work in Jig Borers or similar Machine Tools—optically.
- Interchangeable shanks.
- Built-in illumination through beam splitter.
- Hairline reticule contains concentric circles for checking center distances of holes in work.

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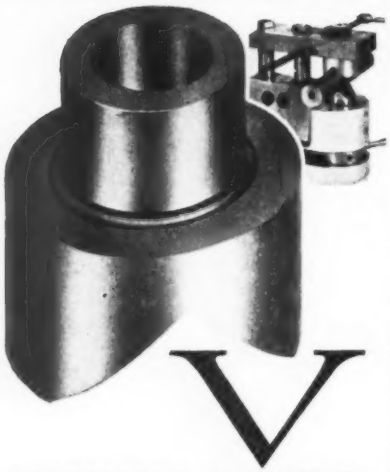

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from ACME INDUSTRIAL

To self center cylindrical, square or hex stock for drilling

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Available in 2 sets of 3 V bushing liners to accommodate slip bushings with O.D.'s of 3/16", 5/16" and 1/2" in a range from No. 80 drill to 11/32" in A.S.A. or Acme standard sizes. Acme V bushing liners . . . a must for every tool box.

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CIRCLE INFORM-A-GRAM KEY NO. 1061

Product News

Accumulators

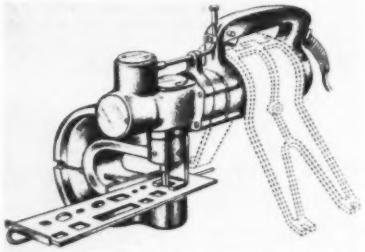
A group of liquid accumulators is designed without gas bags and gases to eliminate possible leakage. Flow and pressure are precisely controlled. Built-in dashpot eliminates piston shock. An accurately controlled feeding device provides predetermined rate of liquid delivery. Component parts from the standard line of Taylor Liquid Spring Shoks can be used. More from Taylor Devices, Inc., 200 Michigan Ave., North Tonawanda, N.Y. Inform-A-Gram No. P50.

Power Shear

A fast new industrial power shear leaves a clean edge in sheet metal, coils, plastics, fiberglass, Formica, aluminum, brass and copper. The portable 4½ lb unit plugs into any 110 v outlet. W.P.B. Industrial Products, Inc., 8244 Christiana Ave., Skokie, Ill. offers the unit electrically, or air driven on application. Inform-A-Gram No. P51.

3-Ton Portable

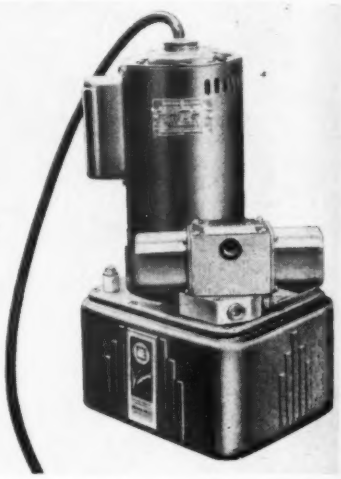
Porta-Press exerts a 6000 lb punch, but weighs a mere 17 lbs. Punch and dies can be easily replaced to punch round, square, rectangular or any shaped holes up to ⅞" dia, in up to 3/16" thick aluminum and ⅛" steel. The unit



does the work of a powerful punch press, yet can be carried to the job or be used on assembly. It's recommended for metal fabrication and general production lines by Modern Mfg. Co., 680 Davisville Rd., Willow Grove, Pa. Inform-A-Gram No. P52.

Vanguard

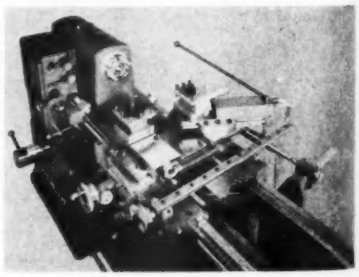
A new model Vanguard two-stage hydraulic pumping unit (VI-Y-60 series) operates at pressures to 6000 psi. The new Vanguard VI, when equipped with a 3450 rpm jet pump motor, delivers the following volume of oil: 600 cu in/min at 100 psi; 400 cu in/min at 500 psi; 135 cu in/min at 1000 psi; 110 cu in/min at 6000 psi. A va-



riety of motors, engines, valves, controls and accessories are available according to Precision Hydraulics Div., Owatonna Tool Co., 547 Cedar St., Owatonna, Minn. Inform-A-Gram No. P53.

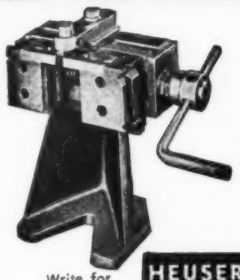
Copying Unit

A new Universal hydraulic copying unit is designed for Cazeneuve HB 500, HB 575 and HB 725 lathes, and does both longitudinal and lateral copying. The chrome-plated slideways on the copying units are automatically lubricated during



operation. A micrometer device allows a finishing cut to be taken immediately after the roughing operation, without need for removing or adjusting the template or tools. For information and specifications, write Cazeneuve Lathes, Inc., 575 E. Linden Ave., Linden, N.J., or Inform-A-Gram No. P54.

SPEED UP DRILLING & TAPPING JOBS!



JOHN'S DRILL JIG

For cross or end drilling round, hexagon or square stock or standard or odd-shaped rough castings from ⅛" to 8" O.D., the self-centering "John's Drill Jig" will cut tooling and production costs for 10 to 100,000 pieces. Standard removable slip fit bushings and holders available to drill center or mean off-center. The self-centering action will hold within .0015" or better regardless of jig wear or piece part O.D. variation. Jigs available in three sizes 6", 8", 14"; jaw openings 2", 3¼", 7½".

Air operated Drill Jig also available.

Write for complete information.

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CIRCLE INFORM-A-GRAM KEY NO. 1071

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TUMBLING MEDIA *for* Deburring and Finishing

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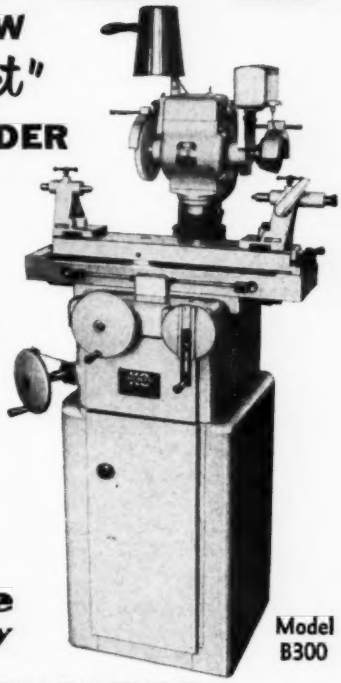
BUYS NEW "Compact" TOOL GRINDER



This precision engineered grinder is guaranteed to do anything that machines costing two or three times more will do.

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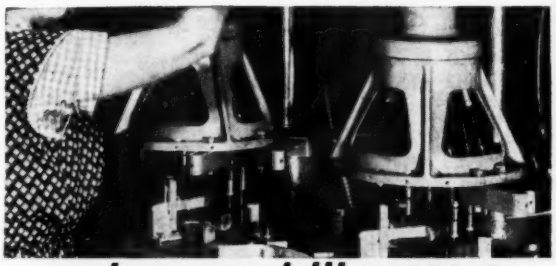

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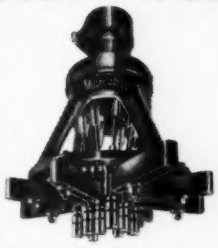

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